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CHEMICAL AGE

BOUVERIE HOUSE · 154 FLEET STREET · LONDON · EC4

SCIENCE AND THE STATE

FEW would disagree with the statement that science and technology are the all powerful dominant factors of our national policy, of our national and international trade, and of our lives. In industry, production methods, particularly the older techniques, are almost without exception under challenge or are in the process of being superseded. The speed of invention and its application is great; and the race in this scientific world is to the swift. Most of all does this apply to us in this country, whose existence depends on our exporting about a quarter of our manufactures in the teeth of world competition. At the same time with these needs to the foremost, Britain is a long way from solving the shortage of scientists and technologists.

These are some of the remarks made by Sir Hugh Beaver, president of the Federation of British Industries and president of the Institution of Chemical Engineers. He was giving his presidential address on re-election as president of the institution on 30 April. The State dominates, either directly or indirectly, in the fields of present and future development. There is no escaping this factor and Sir Hugh declared that the State must play a dominant part in finding a solution.

If maximum results are to be achieved from our scientific potential then there is need for a coherent policy to ensure this, says Sir Hugh. And it is for the first time that we hear of a strong appeal to the Government from an institution which is one of the most important in shaping our future. Thus, clearly put is the charge that a Government which has such vital and widespread responsibilities in regard to the use of science 'cannot discharge its duty in such an almost haphazard and certainly illogical association of activities or inactivities.'

Sir Hugh does not think that with the best will in the world the Lord President of the Council is in a position to be the head of our scientific thinking and planning. For one thing he has neither the means nor the time; and secondly he has only a small part of the field in his control.

The question is asked by Sir Hugh: 'How does Government discharge its responsibilities in respect of the following: education—for production of an adequate supply of scientists and technologists; the procuring of adequate nation-wide research, a question mainly of finance and manpower; securing that the results of research are both known and applied; assistance of development, particularly where this involves, as it increasingly does, a heavy financial burden.'

The considerable financial assistance given by the State to the universities is acknowledged by Sir Hugh, but he points out that this assistance is given through the University Grants Committee. 'There is a studied avoidance of interference in university policy, but the UGC grant has obviously a profound influence, and indeed dictates their whole policy of expansion.' The Minister of Education's no direct, or little indirect, influence, is emphasised. Also emphasised is the fact that there is no positive indication how the problem of the growing shortage of teachers of science is to be solved.

Sir Hugh declares *'Even if there were a national education policy, there is not the national means to secure it . . . although announcements of national*

policy and Government intentions are made from time to time, there is in fact no concrete national policy, nor the national machinery to secure one.'

A recent survey has shown that half our maintained schools, the grammar school type, are inadequately equipped for science teaching by the Ministry's standards; and by the standards set by the Industrial Fund, none of them is properly equipped.

What is the position regarding higher education in universities and university colleges, particularly chemistry, physics, engineering and mathematics? asks Sir Hugh. The proportion of full-time students in these subjects is about 34 per cent of the whole; in 1955-56, 4,444 science and 2,871 technology. Of those with Higher National Certificates (full-time) in 1956, 713 were in chemistry and applied chemistry and in engineering (electrical, mechanical, chemical) 5,811. Altogether, according to the 1956 survey the total of qualified scientists and engineers in this country was then some 61,000 scientists and some 81,000 engineers; just under 142,000 in all, to which can be added a figure of 30,150 engineers with HCN or HND, or equivalent qualifications. Although not insignificant, these numbers of trained persons are wholly inadequate for our needs. More germane is the annual rate of production of trained personnel. The UK was producing in 1954-55, 0.06 engineers per head of population compared with 0.21 in Western Europe, 0.14 in the US and 0.30 in Russia.

It has been estimated that a minimum increase in scientists and engineers of at least 60 per cent between 1956 and 1966 is required to service an annual 4 per cent increase in UK productivity, while by 1970 the annual output of scientists and engineers must be double what it was in 1956. The ultimate solution depends on three things, according to Sir Hugh — agreement by educational authorities that this phenomenal increase in scientists is necessary; the immediate provision of finance; and an adequacy of teachers—the last being perhaps the most important.

Research also comes in for outspoken comment by Sir Hugh. He gives detailed consideration to the principal machine in this country—the Department of Scientific and Industrial Research. It is pointed out that although the Lord President is the Minister who is supposed to be responsible for Government scientific policy and although he has a high-powered Advisory Council on Scientific Policy, 'yet in fact the bulk of Government research or of research sponsored by or paid for by Government does not come under him at all. Fundamental research comes under the universities and therefore under the UGC and the National Research Development Corporation comes under the Board of Trade, as does the Patent Office.'

To Sir Hugh, 'It is clear that no means exist either to formulate or to secure a co-ordinated national policy or research, or to direct the many research activities in the country to desired ends.'

At the same time Sir Hugh has a word to say of research in industry. He feels *'it must be accepted that the total amount of money and manpower devoted to research and development is too small,'* and that there are large units in industry 'surprisingly apathetic to research and unresponsive to invention.' Sir Hugh thinks it clear from a study of manpower engaged in research and development in Great Britain in 1955-56, that the State is taking far too much of the already insufficient trained manpower.

Another fact brought into the open once more is that in almost all sections of industry only a proportion, and sometimes only a small proportion, really makes use of new methods and new materials; or avail themselves of the new opportunities that science offers. Sir Hugh does not ascribe this to any fault of any government, 'although it is to be noted how small a part of our rulers, either the legislative or the administrative, has had any scientific training.' Perhaps, he suggests, this is the reason that industry can still only assist scientific education or research generally by the 7-year covenant when such expenditure should be recognised as a proper duty of business and a normal charge against revenue. We believe that Sir Hugh is right when he says that 'much more must be done to produce both the attitudes of mind and the conditions that will secure an ever increasing flow of our financial resources and of our effort into the use of research.'

All in the scientific world are, we feel, in agreement with Sir Hugh that there should be some means of creating a proper UK scientific policy on all these points. It may be, as he suggests, 'attractive to toy with the idea of a Minister of Science, with an overriding position like the Minister of Defence,' although the creation of such a post may, for many reasons, be impossible or perhaps not even ideal. For our part we do not feel that this should be so. In the US, William R. Brode was appointed in January as science adviser to the Secretary of State. Brode's work is to advise the State on the impact of science on policy, and to advise on the impact of policy on science.

The UK Government must soon wake up to the fact that progress both on a national scale and by individual industries will be retarded until a central policy of scientific advancement is adopted and vigorously pursued.

RUBBERS FROM TIN COMPOUND

BY polymerising either the methacrylic or acrylic acid ester of dibutyl tin, research workers at the Army Quartermaster Research and Engineering Laboratories, Natek, Massachussets, US, have produced for the first time from a tin compound elastomers with typical rubber properties. Describing this work at the 133rd ACS national meeting, Montermoso and his co-workers say that since tin resembles silicon from whose organo derivatives many commercial elastomers have been developed, it has good possibilities for polymer formation. However, dialkyl and diaryl derivatives of tin oxides are insoluble, infusible polymers. But the alkoxy and dicarboxylic acid derivatives of tin are similar to corresponding silicon and carbon compounds.

To prepare the monomer, tributyl tin oxide is reacted with methacrylic acid in a one-to-one ratio to yield methacrylic acid ester of tributyl tin oxide in crystal form. Acrylic acid also reacts with this tin compound in the same way. Polymers of the acrylic monomer are described as softer and less tough than those of the methacrylic monomer.

Polymerisation will take place, it is stated, either in solution, using benzene as solvent or in water-emulsion, using a nonionic emulsifier. Methacrylic monomer has been polymerised on a hot-water bath using benzene as solvent and benzoyl peroxide as catalyst. The product which results is described as a tough, semi-solid material with typical rubber properties. If dicumyl peroxide is substituted as catalyst, a harder, tougher polymer with high tensile strength is formed. Acrylic monomer polymerised with benzoyl peroxide catalyst yields a viscous oil. If four times the amount of catalyst is used, a soft rubbery polymer results.

Other details revealed are that the methacrylic monomer was polymerised at a temperature of 50°C in a water emulsion using Tergitol NPX, a nonionic emulsifying agent. A lauryl mercaptan—potassium persulphate system was used as modifier-catalyst. The polymer resulting is tough, rubbery material. In the same system acrylic monomer produces a less tough and elastic polymer.

The products are said to be typical chain-type vinyl polymers with carbon-to-carbon connecting links. The carboxyl-tin group is attached to the chain in a pendent position.

Joint Research Project on Sterilising by Irradiation

MARKED progress in the programme of co-operative research devised to evaluate the use of radiation sources for the sterilisation of pharmaceutical preparations is announced in the 'Annual Report and Year Book' of the Association of British Pharmaceutical Industry, issued this week. The investigations have been arranged by a working party consisting of scientists from the isotopes division of the Atomic Energy Research Establishment, from the School of Pharmacy, University of London, and from 18 member firms of the association. As a result of preliminary findings, the bacteriological investigations have been extended so that the effect of different levels of radiation on a wider range of organisms might be examined. The work carried out to date has confirmed earlier views that the level of radiation required to ensure sterility varies considerably according to the organism present.

In some circumstances, it is reported, a dose of 2.5×10^6 rad. may be required and, consequently, this level of radiation has been taken as the minimum dosage to be used in the examination of various pharmaceutical preparations and chemical substances. Examination of other preparations has indicated, however, that this level of radiation appears to produce no appreciable loss of potency although some change in colour may occur. Further investigations are now being carried out to evaluate the significance of the colour changes; and biological tests for toxicity are to be undertaken. A paper incorporating results of these investigations will be presented by Dr. T. Horne, Isotope Division, AERE, at the Second International Conference on the Peaceful Uses of Atomic Energy to be held at Geneva in September, 1958.

The ABPI report reveals that 1957 was a record year for Britain's pharmaceutical exports. Products to the value of nearly £40,000,000 were despatched overseas. This figure surpasses the previous year's exports by over £3½ million.

The principal overseas markets were Australia with purchases of £3.4 million and India, £2.9 million. Next in order were New Zealand, the Union of South Africa, Nigeria, the Irish Republic, Burma and China, who received exports of over £1 million each.

A voluntary price regulation scheme affecting certain categories of medical specialities negotiated between the Health Department and the ABPI, came into operation on 17 June last year, and is to run for a trial period of three years. The ABPI's view is that as the industry's prices are fair and reasonable, the savings achieved cannot be large in relation to the total expenditure on the products to which it applies. The scheme will prove worth while if it fulfils its object of removing excesses where these exist, provided that it leaves the industry free to develop without damaging restriction on research and export enterprises.

It is reported that a committee has been set up to investigate problems associated with materials used in the packaging of pharmaceutical products.

Growth Rate of UK Chemical Industry Slows, says Treasury

ALL the available information points to some slowing down in the growth of activity in the chemical industry in the fourth quarter of 1957. After a 6 per cent rise in output in the first half of 1957, chemical production in the second half was only 2 per cent above a year earlier. Towards the end of the year the rate of increase over a year earlier slowed down in the paint and plastics sectors; by the end of the year output of general chemicals was running below a year earlier.

The rate of increase in the consumption of sulphuric acid, a pointer to activity both in the chemicals group and in industry as a whole, fell from 6 per cent above a year earlier in the first three-quarters of 1957 to 4½ per cent above in the fourth; in the first quarter of 1958 consumption was a little lower than a year earlier.

This review of the chemical industry appears in the latest *Bulletin for Industry*, published by the Treasury. It is stated that much of the rise in production in the first part of 1957 was due to higher exports. This increase had ended by the fourth quarter, when the volume of exports was marginally lower than a year earlier, compared with a rise of 12 per cent in the first three-quarters.

Sales of plastics materials in 1957 were 16 per cent above a year earlier, but the rate of increase in the fourth quarter, at 11 per cent, was below that of the previous three quarters. By the end of 1957, production in the soap and detergent industry as a whole had fallen below the 1956 level.

After a prolonged rise, chemical prices fell marginally during the first quarter of 1958. Any such movement, it is stated, could benefit the industry's exports. Also, as a wide-ranging supplier of materials, the industry can help in keeping UK prices competitive. The heavy investment of recent years and big advances in technology should put the UK chemical industry in a strong position to contribute to price-stability and deal with any short-term fluctuation in demand. The longer-term outlook remains one of steady expansion. (See also 'Distillates', page 872.)

Sewage Bacteria and Sucrose-base Detergents

RESEARCH work is being carried out by Howards of Ilford Ltd., Ilford, to test whether synthetic detergents based on sucrose esters are broken down by sewage bacteria. It was announced last year (CHEMICAL AGE, 30 November 1957, page 884) that Howards had obtained from the Sugar Research Foundation in New York manufacturing rights for a range of sucrose esters which are non-ionic surface active agents. These are marketed under the trade name Sorbester S.

The White Paper covering the work of the Cremer committee on the subject of synthetic detergents in sewage, has focused attention on the fact that most, if not all, of the synthetic detergents at present in use cannot be broken down by sewage bacteria and hence persist in sewage and sewage effluents, giving rise to various foaming problems in drains, sewage, disposal works, rivers, harbours, docks etc.

Therefore synthetic detergents based upon sucrose esters, i.e. combinations of sugar and edible fatty acids, are of considerable interest, say Howards, as they would appear likely to assist in overcoming this particular problem.

It would be anticipated, by analogy with similar materials such as fats and fatty oils, that ready breakdown would occur in the presence of the normal sewage bacteria. In these circumstances, it would appear probable that the sucrose esters will not give rise to the problems at present being considered by the Cremer committee.

One of these materials, sucrose stearate, has already been shown by laboratory tests to have good properties as a scouring agent for both synthetic fibres and wool. It has been shown to have good detergency power and, in some cases, to give improved colour and a handle superior to that obtained when using conventional scouring agents.

These materials were initially developed by the Sugar Research Foundation who have taken out various patents in connection with them.

Widnes Oppose Extensions of Alkali Act

Widnes Corporation, Lancashire, has decided to inform the local Member of Parliament that, while the closest co-operation has always existed between the corporation and the alkali inspectorate, they agree in principle with the Association of Municipal Corporations in opposing the extension of the Alkali Act.

Councillor R. Illidge stated at a recent town council meeting that the AMC was in favour of retaining control by local authorities over nuisances caused by smoke and fumes.

Chemical Workers Pay Claim

A 'substantial' pay rise claim has been tabled on behalf of 126,000 workers in the chemical industry. The application affects some 106,000 workers in heavy chemicals and will be heard on 15 May. The application affecting 20,000 workers in the drug and fine chemicals section of the industry will be heard on 23 May.

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The farming industry in Britain has shown an increase in production per man employed of 70 per cent during the past 30 years. This compares with 90 per cent for the chemical industry, 60 per cent for all manufacturing industries and 20 per cent for mining and quarrying.

★ WHILE there is a Government subsidy on artificial fertilisers for agriculture, there is none for the valuable organic fertilisers produced from the sewage of big cities. Halifax Corporation considers this state of affairs should be remedied. Consequently it has written to Bradford and Huddersfield Corporations suggesting the submission of joint representations to the Ministries concerned. Halifax Corporation also wants a reduction in the freight charges for its powdered fertilisers.

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Now the average weekly man-hours expenditure is down to about 8,000 and overtime has been reduced from between 1,200 and 1,600 hours a week to under 50, most of which is taken up with shift workers who maintain certain continuous operations over each week-end. The introduction of controlled bonus incentives has kept take-home pay at the same level.

How this was achieved is described in the latest issue of *Management Views*, published by Remington-Rand Ltd., whose equipment has been used to mechanise and control the allocation of work to maintenance staff, handling of spare parts, and maintenance of orders and purchase records.

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The most serious hazard in working with p.t.f.e. arises from its decomposition on burning tobacco as the decomposition products are liable to be inhaled. While no one can deny that there is a toxic hazard when processing p.t.f.e., it can be reduced to negligible proportions by taking simple, sensible precautions, which include adequate ventilation and a ban on smoking. The most serious symptoms recorded are rather like a dose of influenza lasting only a few hours.

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Investment per head is, in fact, higher in the chemicals industry than in any other. This new capacity has provided both higher output per man and more employment opportunities. Whereas manufacturing output per man as a whole has risen by 35 per cent since 1948, in chemicals it has risen by 58 per cent. Since 1948 nearly 100,000 more people have found employment in the industry which has increased its labour force by a fifth.

The following table is a measure of the health of the chemical industry. It shows that although the UK share of world trade has fallen slightly, the volume of chemical exports has risen strongly and steadily:

	Export volume of chemicals 1954 = 100	UK's per cent share of world trade
1951	91	17.2
1952	78	18.9
1953	79	17.2
1954	100	16.3
1955	117	16.7
1956	126	15.8
1957	137	15.7

Alembic

'THE INDUSTRY OF THE FUTURE'

L. to r., Mrs. Peter Tanner, with her father Sir Hugh Beaver and Dr. H. H. Rosenbrock [Constructors John Brown], joint Moulton medallist; Mrs. Peter Heilbron, Prof. Sir Ian Heilbron, Mrs. and Major-General A. J. H. Dove, technical director, FBI

Peter Thorneycroft at Chemical Engineers' Annual Dinner

THE chemical engineering industry was the industry of the future, declared the Rt. Hon. Peter Thoneycroft, MP, when he proposed the toast of The Institution of Chemical Engineers on the occasion of the annual dinner on 30 April.

Two factors, Mr. Thorneycroft said, were of importance now—growth of home competition and expansion in overseas markets. Competition had a part to play in this country. He went on to discuss the implications of the Restrictive Trade Practices Act and reduction of controls. The Act was removing from the industrial field a wide range of agreements. It was helping those beyond the field of the politicians and it had already resulted in the stopping of other agreements. Of controls over production, etc., he hoped the day would soon come when these were swept away. Mr. Thorneycroft suggested that perhaps chemical engineers should compete one with the other. Possibly we were entering an age when this would be so and when there would be competition overseas. It was only right that such should occur so that chemical engineers could meet with the coming free trade in Europe. This would be a tribute to our strength and he believed that wider markets would develop.

Chemical engineers had a role to play. It had been said that industry should expand in this country. However, the rate of expansion was greater than five years ago. But Mr. Thorneycroft stated that he believed that reduced taxation was the method to ensure expansion.

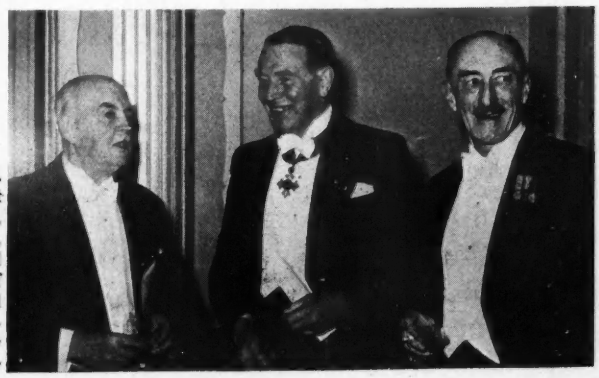
'You are the industry of the future' Mr. Thorneycroft told the institution's members. They were the men who developed devices, who could 'turn base metal into gold.' Their industry was the one which was shaping the future of Britain's industrial effort.

Prof. Sorgato, left, professor of chemical engineering, Padua University, and R. C. Odams, joint hon. secretary, I.Chem.E.

The president of the institution, Sir Hugh Beaver, proposing the toast to the guests, read messages from HM the Queen and from the institution's patron, Prince Philip. Sir Hugh then referred to Mr. Peter Thorneycroft's work as President of the Board of Trade. Today, he said, the BOT was the great creative ministry of the country. It had not grown in accordance with Parkinson's Law, but with this country's growth overseas. It had increased greatly during the period of Mr. Thorneycroft's tenure of office; he had contributed much to the Board.

Sir Graham Hayman, chairman of the Distillers Co. Ltd., responding for the guests, said that it was a source of great justifiable pride that the institution had matched the growth of the chemical industry. The application of the great number of discoveries in the years since the war would not have been possible, he claimed, without the chemical engineers for design, construction and in operation of plants. Their contribution was an achievement of great significance and he believed that the future held prospects of even greater achievements.

Today the chemical industry was spending rather more than twice the sum spent by any other industry. In paying tribute to the institution, Sir Graham said that its work had been guided by successive chairmen who had ably supported a key scientific body in the broadest sense.



L. to r., C. S. Garland, past president I.Chem.E., Prof. W. Wardlaw, president, Royal Institute of Chemistry, and Dr. H. J. T. Ellingham, RIC secretary and registrar

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★ BETWEEN invention and output, recent years have seen a massive programme of investment in the chemical industry. The industry contributed 6 per cent of manufacturing output in 1948, but between then and 1956 it took 16 per cent of manufacturing investment. The April issue of *Bulletin for Industry*, published by the Treasury (see also p. 871) states that in absolute terms the industry's investment was greater than in the engineering, shipbuilding and electrical industries combined, or in vehicles and aircraft.

Investment per head is, in fact, higher in the chemicals industry than in any other. This new capacity has provided both higher output per man and more employment opportunities. Whereas manufacturing output per man as a whole has risen by 35 per cent since 1948, in chemicals it has risen by 58 per cent. Since 1948 nearly 100,000 more people have found employment in the industry which has increased its labour force by a fifth.

The following table is a measure of the health of the chemical industry. It shows that although the UK share of world trade has fallen slightly, the volume of chemical exports has risen strongly and steadily:

	Export volume of chemicals 1954 = 100	UK's per cent share of world trade
1951	91	17.2
1952	78	18.9
1953	79	17.2
1954	100	16.3
1955	117	16.7
1956	126	15.8
1957	137	15.7

Alembic

'THE INDUSTRY OF THE FUTURE'

L. to r., Mrs. Peter Tanner, with her father Sir Hugh Beaver and Dr. H. H. Rosenbrock [Constructors John Brown], joint Moulton medallist; Mrs. Peter Heilbron, Prof. Sir Ian Heilbron, Mrs. and Major-General A. J. H. Dove, technical director, FBI

Peter Thorneycroft at Chemical Engineers' Annual Dinner

THE chemical engineering industry was the industry of the future, declared the Rt. Hon. Peter Thoneycroft, MP, when he proposed the toast of The Institution of Chemical Engineers on the occasion of the annual dinner on 30 April.

Two factors, Mr. Thorneycroft said, were of importance now—growth of home competition and expansion in overseas markets. Competition had a part to play in this country. He went on to discuss the implications of the Restrictive Trade Practices Act and reduction of controls. The Act was removing from the industrial field a wide range of agreements. It was helping those beyond the field of the politicians and it had already resulted in the stopping of other agreements. Of controls over production, etc., he hoped the day would soon come when these were swept away. Mr. Thorneycroft suggested that perhaps chemical engineers should compete one with the other. Possibly we were entering an age when this would be so and when there would be competition overseas. It was only right that such should occur so that chemical engineers could meet with the coming free trade in Europe. This would be a tribute to our strength and he believed that wider markets would develop.

Chemical engineers had a role to play. It had been said that industry should expand in this country. However, the rate of expansion was greater than five years ago. But Mr. Thorneycroft stated that he believed that reduced taxation was the method to ensure expansion.

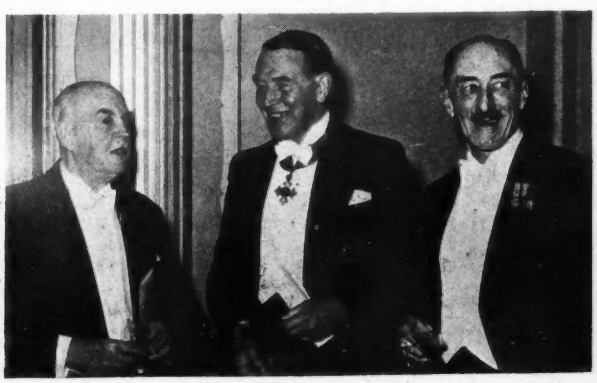
'You are the industry of the future' Mr. Thorneycroft told the institution's members. They were the men who developed devices, who could 'turn base metal into gold.' Their industry was the one which was shaping the future of Britain's industrial effort.

Prof. Sorgato, left, professor of chemical engineering, Padua University, and R. C. Odams, joint hon. secretary, I.Chem.E.

The president of the institution, Sir Hugh Beaver, proposing the toast to the guests, read messages from HM the Queen and from the institution's patron, Prince Philip. Sir Hugh then referred to Mr. Peter Thorneycroft's work as President of the Board of Trade. Today, he said, the BOT was the great creative ministry of the country. It had not grown in accordance with Parkinson's Law, but with this country's growth overseas. It had increased greatly during the period of Mr. Thorneycroft's tenure of office; he had contributed much to the Board.

Sir Graham Hayman, chairman of the Distillers Co. Ltd., responding for the guests, said that it was a source of great justifiable pride that the institution had matched the growth of the chemical industry. The application of the great number of discoveries in the years since the war would not have been possible, he claimed, without the chemical engineers for design, construction and in operation of plants. Their contribution was an achievement of great significance and he believed that the future held prospects of even greater achievements.

Today the chemical industry was spending rather more than twice the sum spent by any other industry. In paying tribute to the institution, Sir Graham said that its work had been guided by successive chairmen who had ably supported a key scientific body in the broadest sense.



L. to r., C. S. Garland, past president I.Chem.E., Prof. W. Wardlaw, president, Royal Institute of Chemistry, and Dr. H. J. T. Ellingham, RIC secretary and registrar

Cement and Fertiliser Works Offended Most under Alkali Act

AT the end of 1957 there were 872 works registered under the Alkali Act, involving the operation of 1,733 separate processes. There was a decrease of 17 in the number of works and 14 in the number of processes compared with 1956. These reductions, says the Chief Alkali Inspector, Dr. J. S. Carter, in his 94th annual report, are due to the concentration of manufacturing operations, particularly at gasworks and by-product plants and to a small extent at salt works, in fewer and larger units.

Complaints were most numerous against cement works (11) and fertiliser granulation plants (9).

Responsibility for emissions of smoke, grit and dust from registered operations was given to the Alkali Inspectorate as from 31 December 1956. Consequently this will presumably be the last of the annual reports dealing essentially with the heavy chemical and allied industries. The 95th report, says Dr. Carter, will most likely relate to an Act in which the older processes are in a minority and an increasing emphasis is necessarily placed on smoke and grit.

Included in this booklet is the report of the Alkali Inspector for Scotland, Dr. E. A. Blafour Birse. The report is published by HM Stationery Office, price 3s. Below, in tabulated form, is a summary of the Inspectors' findings.

Works	Number registered *	Infractions	Complaints	Remarks
Alkali	14 (14)	2	1	No major adverse comment
Cement production	48 (47)	—	10	Figure does not include complaints in Thames and Medway areas
Smelting	25 (25)	—	Minor	—
Sulphuric acid and sulphuric acid (class II)	99 (100)	4 (lead chamber) 5 (contact)	—	Plant operation is satisfactory on the whole
Chemical manure	43 (42)	—	9	Some complaints withheld pending erection of new chimneys
Gas liquor	146 (148)	1	—	Some minor criticisms but only one infraction
Nitric acid	77 (76)	—	a few	Minor complaints but petty faults should be remedied once and for or
Sulphate and muriate of ammonia	78 (83)	1	—	With one exception faults were of minor nature
Chlorine	96 (95)	—	oral	Mostly minor faults
Muriatic acid	169 (171)	—	oral	HCl is so easily absorbed normally that there is no excuse for emission to air
Sulphide	125 (121)	—	several	Evil-smelling mercaptan type compound produced by Midland works. Enormous volumes of contaminated air from viscose rayon and transparent paper industries
Bisulphide of carbon	51 (50)	—	several	Conditions at manufacturing plants are better
Paraffin	45 (38)	—	several	Complaints against 'normal operations' are causing some concern
Bisulphite	87 (88)	—	—	Problems of waste sulphur oxide disposal in titanium pigment production
Tar	122 (128)	2	a few	General operational level has been good
Benzene	280 (289)	2	1	The industry has complied well
Pyridine	34 (34)	—	—	Odour of pyridine is so penetrating that no guarantee of immunity can be given
Bromine	39 (41)	—	—	Industry reasonably well conducted
Hydrofluoric acid	12 (13)	—	—	A satisfactory year
Fluorine	6 (6)	—	—	Operations satisfactory
Scotland				
Alkali	2 (2)	—	—	Results satisfactory
Bisulphite	12 (13)	—	—	Satisfactory
Chemical manure	14 (16)	—	3	Two of the complaints concerned misty fumes from granulation plants. The third concerned a malodorous smell from a granulation plant
Chlorine	5 (5)	—	—	Satisfactory
Nitric acid	4 (2)	—	—	Satisfactory
Paraffin oil	6 (4)	—	2	Difficult to trace source of smells in one case. Suspected that meteorological conditions are involved
Sulphuric acid	13 (17)	—	—	No infringement of limit of 1.5 grains SO_3 per cu. ft.
Tar	15 (19)	—	—	No adverse comment

*Figure in brackets refer to 1956.

Anodically Protected Ti for Chemical Plant Use

THE range of uses for titanium in chemical plant can be further extended, state ICI metals division in leaflet No. 3 on 'Titanium for chemical plant'. Anodically protected titanium carrying a small impressed voltage can now be considered for use in some of the most difficult situations with which chemical engineers are faced. This development has opened the way for titanium equipment in which fully immersed parts can be protected by supplying current from heavy-duty batteries continuously trickle-charged.

Anodic protection equipment, said to be cheap to install and run, means that titanium can now be seriously considered as a material of construction for hot strong sulphuric, phosphoric, hydrochloric, oxalic and formic acids.

Procedure for Supply of Process Details Set Up by BCPMA/ABCM

A PROCEDURE has been established whereby a chemical plant manufacturer can seek assistance of appropriate chemical manufacturers to provide the necessary process details in those cases when the plant producer has received an enquiry for chemical plant from an overseas firm that also requires full technical details of the chemical process involved. The procedure, the main purpose of which is to put the plant manufacturer in touch with suitable chemical producers, was worked out by Dr. E. H. T. Hoblyn, director of the British Chemical Plant Manufacturers' Association, and Mr. George Brearley, director of the Association of British Chemical Manufacturers, and approved by the respective councils and notified to members. This is stated in the annual report of the BCPMA adopted at the annual meeting last week.

With increasing industrialisation in hitherto under-developed countries, the BCPMA executive committee hopes that the new arrangements, which properly safeguard the know-how of the chemical manufacturer, will enable members to secure increased business overseas.

The report also refers to exploratory discussion with the UK Atomic Energy Authority to see how the chemical plant industry could be placed in a position to carry out contracts overseas for plants for uranium metal production and the reprocessing of irradiated fuels, using technical information supplied by the AEA on a commercial basis. Certain members have had individual discussions with the AEA which are expected to lead to the negotiation of agreements under which selected staff members will be attached to the AEA Industrial Group.

On the question of imports, the report refers to a sharp increase in both the quantity and value of chemical plant imports in 1957 compared with the two previous years. The principal source, accounting for 63 per cent of the imports, was West Germany.

Mr. H. W. Fender of Prodorite Ltd. has been elected chairman of the association for the ensuing year (see p. 885).

Gas Board Order Tonnage Oxygen Plant

A TONNAGE oxygen plant is to be installed at the NW Gas Board's new hydrogenation plant at Partington, near Manchester. It is the first tonnage plant to be erected for a Gas Board, and can produce nearly 63 tons of oxygen a day. The oxygen will be used for the partial oxidation of oil for producing hydrogen which will be used to hydrogenate further quantities of oil in order to produce town's gas. Coal will be used as the raw material later.

The contract for the plant has been placed with Air Products (Great Britain) Ltd. by the main contractors, Humphreys and Glasgow Ltd.

NEW INVENTIONS AVAILABLE FOR LICENSING FROM NRDC

DESCRIBED below are inventions selected from the National Research Development Corporation's list, published in their bulletin for April. These are available for licensing at the time of going to press.

From the Ministry of Supply, E. A. Perren and A. M. Kinnear have obtained Patent No. 740 444 for organic phosphorus compounds. A complex, prepared from an alkyl chloride, phosphorus trichloride and anhydrous aluminium chloride, is treated with hydrogen sulphide gas for a predetermined period and the resulting sulphur complex decomposed by treatment with water. The required product is separated from hydrated aluminium chloride, which is liberated from the complex by the water treatment. Compounds such as dithiophosphoethane, monothiophosphoethane, ethylthiophosphoryl dichloride, ethyl-dithiophosphoric acid ethyl ester and monothiophosphomethane can be prepared. It is believed that these compounds may find uses as lubricant additives.

Stable Adducts

Adducts produced by reacting polyester with naphthalene diisocyanate will convert to tough polyurethane films on cross-linking with hardener but prove unstable and gell in two or three weeks in spite of careful drying and storage in an inert atmosphere. According to L. N. Phillips, Royal Aircraft Establishment, Ministry of Supply (Patent Application No. 24513/57) stable adducts which will convert with hardener to form such films are produced by first reacting a polyester or other long chain polyol with a deficiency of naphthalene diisocyanate and subsequently reacting the adduct so obtained with an excess of toluene. The resulting adduct has been found to suffer no appreciable viscosity change, after storage for six weeks in daylight at room temperature with no provision for an inert atmosphere.

Also by the same inventor is Patent Application No. 37622/56, on a mould-separating agent solution which is intended for use in moulding phenolic and epoxy resins. It can be brushed or sprayed on the mould and it dries rapidly, in an even uniformly thick layer, without scum or contamination of the mould.

The solution comprises from 5 to 20 per cent by weight of cellulose acetate butyrate having a butyryl content in the range 10 to 30 per cent by weight and a melting temperature in the region of 180°C, the balance being a solvent for the cellulose acetate butyrate. It is stated that the solvent should comprise at least a major proportion by weight of acetone and may also comprise any one or more of the solvents and diluents: methyl isobutyl ketone, industrial methylated spirit, butyl alcohol, ethyl lactate, toluene, ethyl acetate and diacetone alcohol in a total amount up to 70 per cent by weight of the solvent.

The nature of the moulding operation and the temperature governs the choice of parting agent but a cellulose acetate butyrate of low butyryl content (about 15 per cent) can be chosen for most moulding operations at temperatures around 160°C. Such solutions are reported as having been found satisfactory on moulds made from wood, metal, asbestos fibre, reinforced plastic resin materials, sand impregnated with a furane resin, reinforced polyester resin, plaster of paris and artificial stone such as magnesium oxychloride cement or glass. They may also be applied to enamel surfaces and may be readily dyed for ease of identification.

Amorphous aluminas of large specific surface area may be prepared by precipitation from a solution of a salt in a non-aqueous solvent using an anhydrous base. A patent on this preparation has been applied for by S. J. Teichner of Canadian Patents and Development Ltd. (Patent Application No. 32927/54.) A specific surface area of at least 600 m^2/gm. can be obtained, it is stated, and others can be produced by the same process.

A method for making graft polymers by cationic catalysis is given in Patent Application No. 31652/55. It consists in using polymers containing chlorine or bromine attached to an aliphatic carbon atom in the presence of a Friedel-Crafts catalyst to initiate the polymerisation of olefins, and to alkylate aromatics.

Other patented inventions of chemical interest available from NRDC include the following:

Amino Compounds. Pat. No. 705 919: A method of hydrogenating nitro compounds to primary amines using cyclohexene as a hydrogen donor over a palladium catalyst.

Comirin. Pat. No. 714 427: A fungicidal antibiotic. Although disappointing chemically, it is now being tested by the Paint Research Station.

Scale inhibition. Pat. No. 743 724: Impalpable silica is used to inhibit scale in boilers.

Thorinated ketals and acetals. Pat. No. 748 413. By reacting fluorinated ketones and aldehydes with hydroxy compounds, extremely stable ketals and acetals may be made, e.g., trifluoroacetate with mannitol.

Condensation products of fluoro ketones. Pat. No. 773 402: When trifluoroacetone and similar fluoro-ketones are treated with alkaline reagents, a condensation reaction occurs giving compounds, which it is considered could find a use as insecticides, growth inhibiting agents; or chelating compounds for certain metals.

Diazotisation with trifluoroacetic acid. Pat. No. 761 054: Trifluoroacetic acid can replace mineral acids in diazotisation giving solid diazonium salts which may be safely stored in the dry state for long periods.

Hydrolysis of proteins. Pat. No. 753 613: Hydrolysates for protein therapy can be prepared by a process in which trytophan loss during hydrolysis is inhibited.

Preparation of 2-deoxy-D-ribose. Pat. No. 789 318. A method of making 2-deoxy-D-ribose from mannose through glucometasaccharinic acid is described.

Drop in Consumption of Sulphuric Acid

SULPHURIC ACID AND OLEUM

Tons of 100 per cent H_2SO_4
1 January to 31 March

	Chamber and tower only	Contact only	Chamber, tower and contact
Stock, 1 January 1958	27,502	74,988	102,490
Production	141,102	470,412	611,514
Receipts	15,377	59,228	74,605
Oleum feed	—	937	937
Adjustments	−241	+5	−236
Use	94,100	285,431	379,531
Despatches	64,905	242,229	307,134
Stock, 31 March 1958	24,735	77,910	102,645
Total capacity represented	161,550	520,890	682,440
Percentage production	87.3	90.3	89.6

CONSUMPTION
1 January to 31 March

Trade uses	Tons 100% H_2SO_4 1957	1958
Accumulators	2,638	2,943
Agricultural purposes	485	273
Bichromate and chromic acid	4,482	5,163
Bromine	3,571	3,247
Clays (Fuller's Earth, etc.)	2,624	2,430
Copper pickling	806	547
Dealers	3,218	2,774
Drugs and fine chemicals	5,064	5,352
Dyestuffs and intermediates	23,301	20,383
Explosives	4,926	3,455
Export	1,901	1,262
Glue, gelatine and size	111	157
Hydrochloric acid	14,496	14,393
Hydrofluoric acid	2,898	3,026
Iron pickling (incl. tin plate)	31,823	30,801
Leather	1,260	1,123
Lithopone	4,452	2,641
Metal extraction	969	745
Oil refining and petroleum products	15,913	14,251
Oils (vegetable)	2,036	2,812
Paper, etc.	1,441	1,394
Phosphates (industrial)	157	174
Plastics, not otherwise classified	9,682	9,775
Rayon and transparent paper	74,912	65,208
Sewage	2,500	2,518
Soap, glycerine and detergents	21,942	28,931
Sugar refining	187	138
Sulphate of ammonia	83,756	81,941
Sulphates of copper, nickel, etc.	7,149	4,649
Sulphate of magnesium	380	44
Superphosphates	159,609	155,114
Tar benzole	6,625	8,534
Textile uses	4,942	2,796
Titanium dioxide	74,624	87,482
Unclassified	53,204	48,848
Total	628,084	615,324

Note.—These summaries exclude all Government plants.

RAW MATERIALS

Tons

	Pyrites	Spent oxide	Sulphur: Imported	Sulphur: Recovered, H_2S and filter cake	Zinc concentrates	Anhydrite
Stock, 1 January 1958	239,243	111,972	74,689	10,795	116,590	16,669
Receipts	76,884	67,094	66,591	11,011	55,453	188,124
Adjustments	+1,055	+636	+658	+195	−49	−2,437
Use	96,659	67,538	76,037	11,237	36,664	193,111
Despatches *	2,581	3,340	514	54	—	—
Stock, 31 March 1958	217,942	108,824	65,387	10,710	135,330	9,245

*Including uses for purposes other than sulphuric acid manufacture.

Albright and Wilson's Group Sales Expanded by 10 per cent in 1957

SALES of all companies in Albright and Wilson Ltd. expanded in 1957, the total being about 10 per cent higher at £30 million compared with £27 million in 1956, chairman Mr. S. Barratt states in the annual report.

In the UK, Government measures to halt inflation do not appear directly or indirectly to have influenced sales to home customers. Exports have continued to account for between a fifth and a quarter of total sales. In Canada, the growth in sales and profits, although encouraging, is stated to be somewhat less than had been expected; there was intensified competition from US producers aided by the premium on the Canadian dollar and strikes affecting transport and some customers. In Australia a considerable increase in sales and profits was achieved. The synthetic detergent market there is stated to be in the phase of rapid expansion experienced earlier in North America and the UK; sales of phosphate esters to the oil and plastics industries also increased significantly from the group's US investment, now represented by its holding in Hooker Electrochemical Co.; dividends of $3.78,000 were received during the year.

Lubrizol Expansion

One of the product-groups in which expansion was most marked was chemicals for use in high performance lubricant oils, made at Oldbury and marketed by the associate company, Lubrizol Great Britain.

The subsidiaries at Whitehaven all showed increased activity with profit rises of about the same as in 1956. Solway Chemicals output of sulphuric acid in the year was close to the capacity of the plant. Acid sales to outside customers were reduced slightly by Marchon Product's requirement for the manufacture of sodium tripolyphosphate (transferred from Albright and Wilson (Mfg.) during 1957).

Midland Silicones results in 1957 were encouraging and sales grew in spite of a considerable increase in the quantity of foreign material sold in the UK at dumping prices. The market for silicones continues to expand but is still far less developed than in the US.

Last year group capital expenditure on research and development amounted to about £2 million and this year is expected to show an increase on 1957. In the UK extensions were made to Marchon's phosphates plant, and plants were set up for a number of new phosphorus compounds made by Albright and Wilson (Mfg.). In Canada the new sodium chlorate plant at Vancouver was completed and work was begun on extensions to the plant for this product at Buckingham, Quebec. In Australia the main items were the building of an additional phosphorus furnace and purchase of new office premises. A plant for the manufacture of some of the detergent sulphonates at present imported from Marchon is nearing completion at Yarraville, Melbourne. Investigations are proceeding with a view to establishing a second centre of operations in New South Wales, to meet the expected growth of the market in that area.

It is hoped that work will be started on an extension to the laboratory buildings at Oldbury, and an expansion of technical service and product development facilities for Midland Silicones at Barry. At Oldbury construction is going ahead on the installation of general-purpose plant for the intermediate-scale production of certain organic phosphorus compounds which hold promise for the future.

In the first three months of this year group sales and profits have been higher than for the corresponding months of 1957, but not as high as had been hoped at the time of budgeting. It seems likely from information so far available that this general pattern will persist for much of the year.

Details of the company's trading profits etc., were given in CHEMICAL AGE, 29 March, p. 600.

BP's Expanding Petrochemical Interests

THE oil industry was now in a period of unbalance and adjustment, said Sir Neville Goss in the annual statement on the British Petroleum Co. Ltd. Results for 1957 had been satisfactory despite difficult trading conditions (see CHEMICAL AGE, 26 April, page 782, for report of profits, etc.). In 1958, BP capital expenditure will exceed £100 million, Sir Neville reported. Construction work on the major expansion scheme at BP's Kent refinery is nearing completion and the new units are being progressively brought into operation.

Plant is under construction at Hamburg for production of butane for sale as a petrochemical feed stock. Construction is expected to begin shortly on the new BP refinery in the Ruhr.

In the UK the three companies in which BP participates, British Hydrocarbon Chemicals, Forth Chemicals and Grange Chemicals, have all operated very satisfactorily, said Sir Neville.

Details regarding expansion plans, etc., of these companies were published in last week's issue of CHEMICAL AGE.

BP's French Associate, Société Française des Petroles BP, has a substantial holding in Naphtachimie, whose chemical works are near the Lavera refinery. The capacity of Naphtachimie's working plant was enlarged during 1957 and its production of ethylene was raised from 10,000 to 18,000 tons a year. Production of polyethylene, using the Ziegler low-pressure process, is to start shortly and extensions are in hand which will include increasing ethylene production capacity to 48,000 tons a year. Total production of chemicals is expected to reach 80,000 tons a year. These include ethylene oxide and its derivatives such as glycols, ethanolamines and glycol ethers, and also acetone and isopropyl alcohol. Expansion now in hand is expected to cost £16 million.

Some production units for Erdölchemie GmbH (formed by BP's German subsidiary and Farbenfabriken Bayer last year) at the site adjacent to the Bayer works at Dormagen, Cologne, are already under construction. About 250,000 tons a year of petroleum feed stock will be required by Erdölchemie and will be supplied in due course from the new BP refinery to be built in the Ruhr.

Inco Investment to be Highest Ever

WORK on International Nickel's new nickel mining project in Manitoba is on schedule and the project will be ready for production in 1960, stated Dr. John F. Thompson, chairman of the Board of The International Nickel Company of Canada Ltd., at the annual meeting on 30 April.

The Manitoba project's entire scheduled annual output of 75 million pounds of nickel will come initially from the Thompson Mine, and the company's expansion in Manitoba and Ontario will increase its annual nickel production capacity to 385 million pounds by 1961.

Dr. Thompson noted that while nickel is currently in over-supply, Inco is doing 'those things essential to the development of a future increased market for nickel and the preparation of our production facilities to take care of this anticipated increased demand'.

'Capital expenditures in 1958, it is estimated, will be between $60 million and $70 million. In 1957 they were $43,900,000, the highest for any year, as compared with $23 million in 1956. The larger part of our 1958 capital expenditures will be made in Canada.'

The market for nickel had started in 1957 with an over-demand but it ended with nickel in over-supply. In the US, the principal market, total 1957 nickel supply was 295 million lb., the largest ever available to that country, he said. It exceeded total civilian and defence consumption during the year by approximately 50 million lb. Supplies available in 1958 will again substantially exceed the consumption. The US Government has announced its intention of diverting to industry all of its scheduled stockpile intake in 1958, but it appears unlikely that a market demand will exist for more than a portion of this supply.

At Port Colborne a new process for the electrorefining of nickel by direct electrolysis of nickel matte had been developed. It eliminated high-temperature oxidation and reduction operations, and permitted recovery, for the first time in nickel refining, of elemental sulphur and of selenium.

JOINT WATER POLLUTION RESEARCH COMMITTEE SET UP

FBI Co-operation with DSIR Unit

THE formation of a joint committee of the Water Pollution Research Board and the Federation of British Industries to advise on problems of pollution in which industry is particularly interested, is reported in the annual reports* of the Water Pollution Research Board and of the Director of Research. The federation is to make a substantial financial contribution to the work of the laboratory of the department and a considerable expansion in the programme of research on industrial wastes is expected.

Reduction of nitrate: Further study has been made of the conditions of the Thames Estuary by the Board, and it has become apparent that the part played by nitrate in the economy of the estuary is much greater than was at first thought. Laboratory work carried out supports the conclusion from field observations that nitrate is reduced in the estuary only when the concentration of dissolved oxygen does not exceed 5 per cent of the saturation value. There is also some evidence to show that this limiting concentration is higher when the temperature is higher.

Oxygen balance in surface waters: The level of oxygenation in a polluted stream depends largely on the exchange coefficient for the stream. Variation of this coefficient with temperature has been determined for water flowing through a channel, the value found being considerably less than that previously reported.

Toxicity of Zinc

Toxicity of metal salts to fish: Metal salts may be discharged to rivers as constituents of industrial effluents or may be leached from spoil banks. An investigation has begun of the toxicity of zinc salts. The minimum concentration of zinc reported by different authors as being toxic to fish covers a very wide range, thus concentrations reported to be toxic in 5 days range from 0.4 p.p.m. Zn. in soft water to 100 p.p.m. in hard water. There appears to be wide agreement that the toxicity of zinc and of other metals is less in hard water than in soft. Tests so far made have confirmed this. Zinc in suspension was found to exert as much toxic effect as if it had been in solution. Calcium chloride reduces the toxicity of zinc rather more than does calcium bicarbonate.

Regarding the toxicity to fish of chlorine, preliminary experiments show that the toxicity of a given concentration of residual chlorine is increased by a reduction in concentration of dissolved oxygen. At all concentrations of oxygen tried a given concentration of chlorine was more toxic at pH 6.3 than at the higher values, but toxicity was about the same at the two pH values 7.4 and 8.2.

Toxicity of liquors from gas works and coke ovens: In the 1956 report, some work was described that suggested toxicity to fish of a spent liquor from a gas works was largely due to the monohydric phenols and the ammonia which it contained. Results show that solutions of the phenols present in gas liquors are more toxic than the equivalent solutions of pure phenol; 0.1 part by weight of pure phenol was equitoxic with 0.59 parts by weight of the gas-liquor phenols and 0.71 part of the coke-oven phenols. It is pointed out if present in a river, phenols would have to be determined by a single colorimetric analytical test and the relative toxicities on this basis might well be different.

Both the Gas Council and the National Coal Board are carrying out intensive investigations on methods of treating liquors from gas works and coke-oven works. A promising process, after having been tested in pilot plant, is in operation on a large scale for the treatment of coke-oven effluents. It is biological oxidation by the activated-sludge process. A high proportion of the phenolic substances present is oxidised and in some plants thiocyanate will be decomposed. The concentration of ammonia was not reduced.

Toxicity and pH value

The relative toxicity of the phenols and the ammonia in gas liquor depends on the pH value of the water with which the effluent is diluted. The higher the pH value the greater will be the relative toxicity of the ammonia. It is therefore suggested that it may often be desirable to remove the ammonia by distillation or some other means from a biologically-treated effluent which is to be discharged to a stream, etc., carrying fish.

Effects of synthetic detergents on sewage: It appears from experiments conducted by the Board that the presence of synthetic detergents reduces the rate at which oxygen is absorbed in the activated-sludge process. Under certain conditions this effect could explain the reduction in efficiency which is said to have occurred at some works as a result of the introduction of such detergents.

Industrial waste waters: Biological destruction of cyanide in percolating filters, which has been proved practicable on a small scale, is now being investigated in a pilot-scale filter, 4 ft. in diameter and 6 ft. deep, containing 2.8 cu. yd. of gravel graded $\frac{3}{8}$ in. to $\frac{3}{16}$ in. and fitted with a 4-arm polyethylene pipe distributor rotated at 10 rev./min. by a geared electric motor. As it has been found that the organisms which destroy cyanide become inactive below about 10°C, the whole filter, which is in the open, has been protected from extremes of temperatures.

Using this plant it has been shown that an effluent containing less than 1 p.p.m. hydrogen cyanide can be obtained by treatment of a solution containing 60 p.p.m. hydrogen cyanide at a rate of at least 720 galls./cu. yd. per day, or from solution containing 90 p.p.m. hydrogen cyanide at a rate of at least 645 galls./cu. yd. per day. Experiments are being continued to find the effect of winter conditions on the filter and of treatment of solutions containing mixtures of complex metal cyanides.

The process of anaerobic digestion, hitherto little used for treating industrial wastes in Great Britain, is being tried for treating spent wash produced in the manufacture of whisky. The digesters used in the experiments were of 10 l. capacity, each fitted with an agitator having a paddle rotating near the bottom of the vessel at 13 rev./min. Liquid for treatment was fed automatically to the digester once per hour. Digesting sludge from a sewage works was used as an inoculum and was diluted in the digester with four times its volume of water at 35°C from which dissolved oxygen was removed by a stream of nitrogen. Preliminary laboratory experiments have shown that satisfactory digestion can be obtained if the initial loading is small and is increased only gradually. A reduction of 95 per cent in the BOD has been obtained at a loading of 0.212 lb. BOD/cu. ft. with a period of retention of 10 days. Work is continuing in an attempt to reduce this retention period.

Treatment of Spent Wash

The possibility of treatment of spent wash by the activated-sludge process has also been examined in laboratory units. Spent wash with ammonia (100 p.p.m. N.) and phosphate (41 p.p.m. PO_4) added, was passed through the apparatus at a rate such that the aeration period was 10 days. Results of analysis of the centrifuged final effluent showed that under the conditions described the BOD of the spent wash was reduced by 93 to 99 per cent. The liquid thus appeared to be amenable to treatment by the activated-sludge process, but it is recorded that difficulty would be experienced in removal and disposal of sludge and frothing might be troublesome.

Removal of Ammonia

Recharge of underground supplies: Experiments have been made to determine the changes which occur when a polluted water is allowed to percolate through porous sandstone. It has been found that considerable removal of ammonia and reduction in BOD occurs during percolation through 2 ft. of soil provided that application is intermittent.

Radioactive tracer dosing apparatus: For the determination of rates of flow by the radioactive salt dilution technique, an apparatus for delivering the radioactive solution at a constant rate of flow from a shielded container to the liquid whose flow is to be measured, has been designed. The flow of tracer solution controlled is intermittent, and the pulsations are smoothed out in the process of dilution inherent in this method of flow measurement. In laboratory trials the volume delivered in any period of one minute has been shown to be constant to within ± 0.3 per cent of the mean.

*('Water Pollution Research 1957,' published by HMSO for DSIR, price 6s ($1 8 cents in US), 6s 4d by post. In the US the report is obtainable from British Information Services, 45 Rockefeller Plaza, New York 20, NY.)

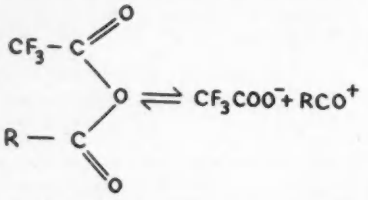
FLUORINE CHEMISTRY DEVELOPMENTS —4

Peroxytrifluoroacetic Acid as Oxidiser, by Dr. W. K. R. Musgrave

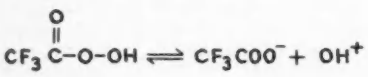
IN ALMOST all of the examples quoted in the literature involving the introduction of the hydroxyl group into an aromatic system the reaction has been ascribed to attack by free radicals, such as the hydroxyl (1) or benzoate (2) radicals, or by addition of a double-bond reagent, such as osmium tetroxide(3) followed by hydrolysis and then elimination of water.

In one case, using perbenzoic acid(4), it is suggested that electrophilic substitution may have occurred but little detail is given and the results are for polycyclic aromatic compounds only.

Since peroxytrifluoroacetic acid is already known to be superior to the other per-acids in oxidising power(5) and since it has been shown that the mixed anhydrides derived from trifluoroacetic acid are ionised slightly into negative trifluoroacetate ions and positive acylium ions(6), it seemed that if the other per-



acids could be considered as electrophilic agents, then peroxytrifluoroacetic acid was likely to be an excellent source of positive hydroxyl groups.

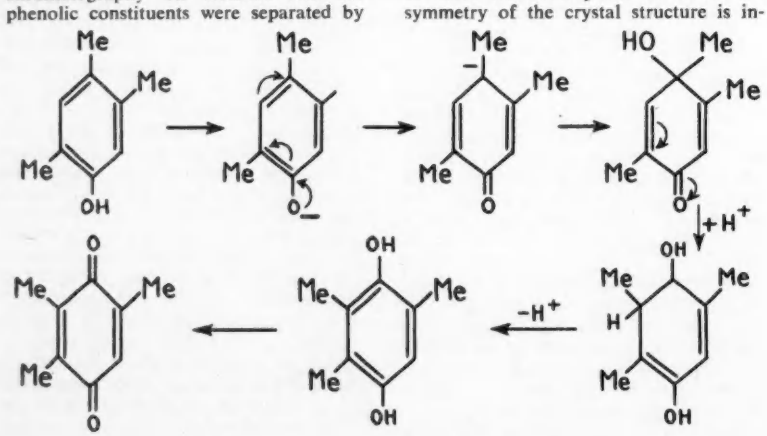


As a result benzene and a series of its homologues were taken and each was treated with one and a half equivalents of peroxytrifluoroacetic acid in methylene chloride solution. The quinones in the reaction mixtures were separated by liquid chromatography on alumina and the phenolic constituents were separated by gas-liquid chromatography of the methylated products.

It was found that benzene and toluene could not be hydroxylated under the conditions used but that m-xylene gave m-2-xylenol, m-4-xylenol, m-xylohydroquinone, and m-xyloquinone, The complete absence of m-5-xylenol showed that the hydroxylation had occurred by electrophilic mechanism. This was confirmed by reactions with pseudo-cumene when 2, 3, 6-trimethylphenol and 2, 4, 5-trimethylphenol were formed but there was no 2, 3, 5-trimethylphenol.

If the phenols are used as starting materials this reagent offers a quick and easy route to the corresponding quinones, some of which could not previously be prepared by direct oxidation. Thus m-2-xylenol, m-5-xylenol, p-xylenol, and 2, 3, 5-trimethylphenol, when treated with about four equivalents of peroxytrifluoroacetic acid, gave the corresponding quinones in yields varying between 50 and 80 per cent. The reaction is not general; o- and m- cresols, and o-xylenol could not be converted to the quinones.

When phenols with methyl groups in the para position were oxidised it was found that the methyl group migrated. Thus mesitol and 2, 4, 5-trimethylphenol both gave pseudo-cumo-quinone and in both cases the migration of a methyl group is involved, The isolation of 2, 4, 5-trimethyl quinol in the latter case prompts the suggestion of the mechanism shown below for the rearrangement.



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Physical Properties of some Fluorine Compounds, by Dr. J. S. Rowlinson

FLUOROCARBONS and the fluorides of many of the elements of groups IV, V and VI of the periodic classification have unusual physical properties. Firstly, they are very volatile and often resemble hydrides rather than the other halides. It was shown that this great volatility is not due to any weakness of the London forces between such molecules but is due to the great strength of the repulsion forces. This strength arises from the fact that the origin of the intermolecular forces in such substances is the 'shell' of fluorine atoms, and is not at the geometric centre of the molecule.

Secondly, the symmetrical members of this group of substances have unusually high melting-points and so unusually short liquid ranges; they have low entropies of fusion, and the solids are easily deformable and generally show one or more transition points at which the symmetry of the crystal structure is increased. These properties are also to be expected for symmetrical 'shell' molecules.

Thirdly, the mixtures of fluorocarbons etc., with every other class of substance have unusually large excess heats, volumes and free energies. The liquids are often incompletely miscible. This property is not fully understood, but may be connected with the different radial dependence of the intermolecular potential between shell-like molecules from that between molecules with more central potentials.

* *Other papers presented at the Symposium on 'recent developments in the chemistry of fluorines', were summarised in Chemical Age, 19 April, p. 727, 26 April, p. 769 and 3 May, p. 833.*

British Oxygen Linde Plants Near Completion

THE new tonnage oxygen plant supplied by British Oxygen Linde which is being erected at Shell Haven by British Oxygen Engineering Ltd. was completed at the end of April and should be fully commissioned in August. The plant is designed to produced 240 tons of oxygen and 235 tons of nitrogen a day for the manufacture of ammonia.

Another British Oxygen Linde plant, under erection at Partington, was completed in April. This plant was built for Petrochemicals Ltd., and is capable of supplying 145 tons of oxygen and 55 tons of nitrogen a day. The oxygen will be used for the direct oxidation of ethylene and this plant is also expected to come into service in August.

The combined value of the contracts for these two plants is estimated to be more than £500,000.

Overseas News

NEW ECONOMIC PROCESS FOR SEPARATION OF URANIUM, THORIUM AND RARE EARTHS

URANIUM, thorium and rare earths in high yields and high purity are claimed to be obtained using a process developed at Ames Laboratory, Iowa State College, US. According to a report given to the 133rd ACS National Meeting held recently, almost all thorium present in monazite ores, together with about 98 per cent of the cerium and about 90 per cent of uranium is separated. Thorium is stated to have no uranium in it; the uranium is free of cationic impurities; and cerium is separated from the other rare earths. The process is also said to be very flexible, it being possible to use several solvent extraction systems, and almost any adequate separation technique, including that of ion-exchange if required.

Of primary importance in this process is the early separation of the uranium. Then by any of a number of solvent extraction techniques, thorium, cerium and rare earths can be obtained relatively free of contamination by each other or by extraneous ions. The separated uranium is recovered free of cationic impurities by an ion exchange.

An outline of the process is as follows: the monazite ore is concentrated and crushed to 95 per cent finer that 65 mesh. This crushed ore is then digested in 93 per cent sulphuric acid at 210°C for four hours. It is then diluted with water, part decanted and the sludge and undigested sand filtered off. The digested material is diluted still further, adjusted to pH 1.5 and rare earths and thorium are precipitated with sodium oxalate. The uranium remains in solution and is recovered using a strongly basic anion exchange resin. The oxalate cake is taken up in hot caustic, freeing the oxalate for recycle and converting rare earths and thorium to their hydroxides. As 95 per cent of the oxalate is recycled, the process should prove an economic one.

The hydroxides are calcined to remove residual oxalate and to oxidise cerium to the +4 state and then dissolved in nitric acid from which cerium and thorium are extracted with tributyl phosphate. The cerium is then reduced with sodium nitrite and cerous cerium goes into the stripping solution. Thorium is removed from the tributyl phosphate by a water strip and the thorium precipitated with oxalic acid.

Czechoslovakia's Chemical Collaboration with Rumania

Czechoslovakia is furnishing Rumania with raw materials, plastics materials, hydrochloric acid, synthetic fibres, and chemical plant. She is also providing various processes for manufacturing pharmaceuticals. In return Czechoslovakia will receive butyl alcohol, sulphuric acid, nitrates, sulphate of ammonia and wood charcoal.

Rumania is also providing know-how for utilisation of natural gas and production of carbon black. There is an exchange of technicians, and the two countries will construct together nitrogen fertiliser factories and a synthetic rubber plant.

W. Germany's Chemical Output Up 11 Per Cent

It was announced in Bonn last week that West Germany's chemical industry output last year amounted to £1,464 million, an 11.4 per cent increase over 1956. The export ratio for chemicals increased from 2 per cent to 25 per cent. Plastics production rose to 589,000 tons—an increase of 22 per cent.

Polypropylene Prices Reduced by Hercules Powder

Hercules Powder Co., US, have announced a reduction of 9 cents a pound in the basic price of natural colour Pro-fax polypropylene plastics material. The new price is 56 cents a pound in truckload quantities. The basic price of polypropylene in colours remains at 65 cents.

Norwegian Chemical Engineering Exhibition

The first large-scale exhibition covering chemical engineering and metallurgy to be held in Scandinavia will take place in Oslo from 15 to 26 October. Exhibits will cater for all aspects of these two fields and in addition study groups will be held, dealing with air and gas purification; crushing, grinding and sifting. The organisers are the Studieselskapet for Norsk Industri (SNI), Forskningsveien 1, Oslo.

Sugar-Based Ester For Coatings

A sugar-based ester, sucrose acetate isobutyrate, is now being produced commercially by Eastman Chemical Products. Initially 1,000 lb. weekly is to be produced, but the company consider that once markets are developed an annual capacity of several million lb. is likely. The substance is expected to have a wide usage in extending solvent coating formulations, i.e. increasing solids content, and reducing solvent requirements and cost. Hot-melt coatings are also promising as well as paper and cloth coating uses.

Esterification equipment similar to that used for dioctylphthalate and other plasticisers is used, and normal esterification procedures are employed using sucrose with acetic and isobutyric anhydrides.

Sucrose acetate isobutyrate is described as highly viscous (100,000 centipoises at 30°C), stable and compatible with most resins, film formers and plasticisers. It is extremely soluble, addition of 10 per cent ethyl alcohol reducing viscosity to 700 centipoises. This lower viscosity form, SAIB-90, is also available commercially.

New Zealand Uranium and Potash Developments

Talks will take place shortly in London between the Deputy Prime Minister of New Zealand and the UK Atomic Energy Authority on the development of uranium deposits on the west coast of the South Island of New Zealand. The authority have drawn up a development programme but New Zealand hopes that the planning will be more positive than suggested. The minister will also have talks with the Dutch regarding their establishment of a plant for the extraction of potash from sea-water by means of complete coal gasification.

Anic Open Fertiliser Plant in Ravenna

A new plant to produce nitrogenous fertilisers at an annual rate of 750,000 tons has been opened in Ravenna by the Italian Anic Co. The company's majority shareholder is the ENI-Statal Group.

Widespread rumours that Anic had given the Italian Montecatini chemical company sales rights over two-thirds of the Ravenna factory's output of nitrogenous fertilisers for a period of ten years, are denied by the chairman of the company, Snr. Enrico Mattei.

Increase in Canadian Chemical Production

Canadian production of chemicals and allied products totalled $1,044.1 millions in 1955 compared with $935.7 millions in 1954, an increase of about 11.6 per cent. The net value of production, or the value added by manufacturing, also advanced to $528.9 millions in 1955 being 11 per cent higher than the $476.1 millions in 1954 according to the review just issued by Dominion Bureau of Statistics.

There were 1,126 plants in 1955 with approximately 52,000 employees and an aggregate payroll of $185 millions. Exports of chemicals and allied products showed an increase in 1955, the value of $210.0 being about 30 per cent higher than the $161.3 millions in 1954. Exports to the US amounted to $111.7 millions of 53 per cent of the total shipped to all foreign countries. Imports at $260.5 millions increased about 18 per cent over the $220.6 reported in 1954. About 85 per cent of the imports came from the US while the UK accounted for about 10 per cent.

Wax Produced from US Sugarcane

Wax from US sugarcane has been produced on a laboratory scale by filtration-extraction, and the experiments were sufficiently successful to justify further investigations on a larger scale, according to Joseph Pominski, J. J. Spadero, and

H. L. E. Vix, US Government researchers at the Department of Agriculture's Southern Utilisation Research and Development Division, New Orleans, Louisiana.

Wax from domestic sugarcane may partially meet the demand now supplied by imported waxes such as carnauba and curiouri. It is estimated that domestic sugarcane is a potential source of about seven million pounds of crude wax, which yields approximately 60 per cent hard wax.

The filtration-extraction process recently developed at the Southern Laboratory for extraction of oil from cottonseed, soybeans, and other oilseeds was modified for the extraction of wax from sugarcane mud, with encouraging results. Mass velocities as high as 5,900 lb./hr./sq. ft. have been attained in the filtration-extraction process, with a high efficiency of crude wax recovery.

US Polyethylene Exports

US Government statistics for January this year show for the first time the amount of polyethylene the US is exporting. Just over 19.8 million lb. were exported in January. This includes some unfinished and semi-finished products but no laminates, film or sheeting. Total film and sheet exported reached 950,000 lb.

Principal importers of US polyethylene are: Japan, nearly 3 million lb; France, nearly 2.5 million lb; Western Germany and Belgium, about 2 million lb. each; while the UK and the Netherlands imported about 1.5 million lb. each.

It was estimated that if US polyethylene exports continue at this rate throughout 1958, a total of some 240 million lb. could be exported—about one-third of US production.

Chilean Sulphuric Acid Plant Opened

A plant capable of producing 12 tons of sulphuric acid a day has been opened recently at Compañía Baja, Coquimbo Province of Chile. Machinery for this plant was imported from Germany at a cost of US$190,000. Production is to be delivered to the Caja de Credito y Fomento Minero, to be used in producing copper concentrates. The installation of the plant allows for a potential output of 1,500 tons of refined copper a year and will make possible the working of several deposits of copper oxide in the region.

Montecatini Net Profit Up £401,000

Trading in the chemical industry was irregular in 1957 it is stated in the annual report of Montecatini. Production of sulphuric acid and phosphate fertilisers declined and the situation of copper sulphate remained rather unfavourable. On the other hand the trend for copper based insecticides was favourable.

Anxiety is felt about the rising production capacity in Italy for nitrogen and nitrogenous fertilisers as a consequence of the entry into production of new Edison and Anic's plants and because of over-production in other countries. Prospects for the production of polypropylene are said to be excellent. There is a considerable export demand, but this could not be satisfied yet because of lack of supplies.

The 1957 net profit was 11,589,868,873 lire (£6,626,000) compared with 10,870,093,641 lire (£6,225,000) in 1956. The dividend is maintained at 115 lire per share.

Ignition Retardant for Boranes

A low concentration of iron carbonyl is reported as proving a useful ignition retardant for borane fuels, making these safer to handle in the future. This work is reported by the Rensselaer Polytechnic Institute, Troy, New York, US. The iron carbonyl has been found to raise appreciably the temperature required to ignite a borane-oxygen mixture.

Chemical Projects Proposed in Hungarian Three-Year Plan

A number of chemical projects are planned in Hungary under the new three-year plan which entails a further industrialisation of the country. At Szolnok, a large superphosphate factory is to be erected. By utilising natural gas from Rumanian oil fields, the starting materials for the manufacture of synthetic fibres, plastics as well as fertilisers are to be manufactured at Tiszapalkonya. A new plant for the manufacture of DDT is scheduled to start operations this year with an output of 1,000 tons yearly.

In Budapest, a new caprolactam plant is to be built while another works will process this material into synthetic textiles of the Perlon type. The Hungarian dyestuff industry, which now produces about 1,000 tons of synthetic dyes a year, is to be considerably expanded as a result of the planned erection of a new factory in Budapest with an annual output of not less than 6,000 tons. The local rubber manufacturing industry has undergone a considerable expansion since 1948 and output now meets home requirements and even leaves an export surplus.

Sulphuric Acid Plant at Timna, Israel

The state-owned mine, King Solomon, in Timna, Israel, will have a 90-tons-a-day sulphuric acid plant in operation this summer. The copper ore reserves have been mined by open-cast mining and so far are producing at the rate of 7,000 tons of 80 per cent copper concentrate. This is sent abroad for refining.

Indian Fertiliser Contract

In Leipzig recently a long-term trading contract was concluded between the State Trading Corporation of India and Germany, in regard to ammonium sulphate and potash fertilisers. The contract is stated to be worth 50 million rupees. Deliveries are to be made over the period of 1958 to 1960. The papers concerning the Indian deliveries of goods in exchange have to be concluded.

French Petrochemical Developments Outlined by Esso

A RECENT bulletin produced by Esso Standard, French subsidiary of the Standard Oil Co., New Jersey, US, reports that ethylene production was 17,300 tons in 1957 but to meet anticipated demand in 1962, would have to rise to 126,000 tons. Last year 75 per cent came from coal, but in 1962 68 per cent of ethylene production would come from the petrochemicals industry. Propylene output reached 50,000 tons in 1957, 42 per cent of which was produced by Esso Standard. Expansion of Esso's refining units will raise output of this product in 1962 to 142,000 tons, slightly more than the estimated consumption. Butadiene production, now of the order of some hundred tons, is to be increased to 12,000 tons next year, most of it coming from Esso's new unit at their Port Jerome refinery.

Supplies of benzene in 1957, after years of surplus, just met requirements. Production totalled 71,000 tons and consumption 68,000 tons. Home consumption is expected to double by 1962 due to the increased needs for styrene and detergents. Benzene from coal will remain at an annual level of 100,000 tons, but French petroleum industry will have to supply the additional 35,000 to 40,000 tons. Considerable demand for xylene and heavy aromatic oil products is forecast. Production was 8,100 tons and consumption 13,000 tons in 1957. In 1962 demand is likely to be 45,000 tons and domestic needs 38,000 tons.

Of 438,000 tons of detergents produced, 43 per cent (190,000 tons) were derived from synthetic processes. The bulk was consumed on the home market. In 1961 consumption of detergents (soap and synthetics) is expected to reach 445,000 tons but production will reach 680,000 tons. Synthetic detergents will rise to 430,000 tons with natural soap products remaining at the present level.

France continued to import plastics in 1957. Production totalled 155,000 tons but consumption was 189,000 tons. In 1962, production is expected to total 345,000 tons, with consumption estimated at 315,000. Polystyrene and polythene resins will also increase.

Synthetic fibre output reached 17,000 tons in 1957 and consumption totalled 14,000 tons. In 1962, output is estimated to reach 48,000 tons with domestic consumption rising to 38,000 tons. Half of the domestic consumption will be polyamides.

Solvent output in 1962 is put at 405,000 tons against a demand for 465,000 tons. Last year 300,000 tons were produced and 285,000 used.

GERMANY'S 'BIG THREE' REPORT HIGHER SALES IN 1958

But BASF Sound a Warning Note

THE three leading companies of the West German chemical industry have now published their annual reports. The following table shows that while all three have increased their manpower, all three have also substantially raised their sales, particularly in foreign markets. Turnover per worker therefore continued to rise, especially in the Badische Anilin- und Soda-Fabrik works at Ludwigshafen which last year secured the largest increase both in total and in export sales.

	Bayer	Hoechst	BASF
Labour force	49,797	42,739	38,381
Increase %	6.3	7.9	4.8
Total sales (mill. DM)	1,853	1,760	1,800
Increase %	16.1	16.6	20.1
Home sales (mill. DM)	1,094	1,192	1,116
Increase %	13.9	15.4	13.1
Exports (mill. DM)	759	568	684
Increase %	19.3	26.8	31.9

The increase was achieved in the face of more intensive competition, but proceeds were not materially affected by such price concessions as became necessary in some fields. In general prices on the domestic market showed little change while wages and other costs tended upwards; increased output per worker due to the large capital expenditure on new plant and machinery in recent years however, made up for inevitable cost increases. All three companies are raising their dividend by one per cent, as they have done in the preceding years, and have made substantial allocations to open and apparently also to hidden reserves.

Capital expenditure on new plant and extensions and on modernisation and improvement of existing machinery continued on a high level although Hoechst show a slight reduction compared with the preceding year and BASF a somewhat larger but temporary falling-off in new investment expenditure.

	Bayer	Hoechst	BASF
New investment (mill. DM)	314	232	227
Rise (+) or fall (−) %	+16.6	−3.8	−21.2
Depreciation (mill. DM)	197	152	170
Increase %	11.7	18.1	44.6

Research expenditure again amounted to about 5 per cent of sales in all three companies.

Expenditure on new plant and development imposes a heavy financial burden on the companies. Bayer show in the 1957 balance-sheets an increase in bank loans to DM 224.7 (131.2) million and in 'other liabilities' to DM 347.6 (301.9) million. This year therefore the share capital has been increased by DM 110 million, and a similar amount of additional shares will probably be issued next year. The balance-sheet of Hoechst shows an increase in total liabilities to DM 732.9 (579.7) million. Another DM 100 million will be obtained this year by a long-term loan, and DM 100 million of new shares are to be issued by Hoechst next year.

BASF raised share capital last year by DM 102 million and thus avoided an increase in debts; loans from banks were actually reduced to DM 130.6 (153.0) million, and the company does not envisage any share issues this year although DM 250 million are to be invested in new plant in 1958 and again next year. Hoechst anticipate capital expenditure of DM 240 million each in 1958 and 1959, while Bayer expect to hold capital expenditure below the exceptionally high rate of 1957, even though it is likely to remain above DM 200 million.

As regards the major expansion projects, Bayer report that substantial sums were invested last year in extending the plant for synthetic fibres, especially Perlon and Dralon. Considerable amounts were also spent by Bayer on increasing the production of plastics and enlarging the installations for rubber chemicals and special grades of synthetic rubber. Production of Perbunan N at Pernabuant is to be expanded considerably this year, as stated in CHEMICAL AGE, 3 May, p. 831.

Titanium Dioxide Plant

Among other development schemes of Farbenfabriken Bayer is a titanium dioxide plant at Uerdingen, the first stage of which was completed last autumn. DM 17 million were spent until the end of last year on the petrochemicals plant at Dormagen. A Canadian subsidiary, Bayer Foreign Investments Ltd. of Toronto, was formed late last year for the efficient administration of Bayer's foreign interests, and it is hoped to place shares of this company in foreign capital markets in a few years' time even though they are at present still held exclusively by the German Bayer company whose interests in Western Europe, Africa, and North, Central and South America will be transferred to the Canadian company in the next few months.

Hoechst spent large sums last year on extending the petrochemicals installations at Höchst and Gendorf. New plant for basic chemicals were built at Knapsack, and much attention was devoted to extending the production of fibres and foil at Bobingen. Hoechst have acquired 25 per cent of the capital of Ruhrchemie AG of Holten in order to secure a steady supply of ammonia and nitrogen fertilisers. Synthesekautschuk-Beteiligungs-GmbH, the subsidiary who hold Hoechst's 50 per cent share in Bunawerke Huls GmbH, have raised their capital from a nominal sum to DM 21 million; the production of synthetic rubber at Hüls is to start this summer.

Badische Anilin- und Soda-Fabrik report that a new large sulphuric acid plant was put into operation. Extension of production capacity for synthetic fibres has been speeded up, and the company also had its full share in the expansion of plastics production. Work on extensions for Rheinische Olefinwerke GmbH of Wesseling, in which BASF hold a 50 per cent share, is being continued, and some sections are expected to start operations before the end of this year. Apart from DM 27 million being spent on a low-pressure polyethylene plant, investments totalling DM 200 million are envisaged at Wesseling. About DM 10 million have so far been invested abroad by BASF but several major projects are likely to be announced shortly.

Unlike the other two companies, however, BASF sound a warning as regards two sections of their activities. 'Ruinous competition' in detergents has caused the company to discontinue the production of alkylaryl sulphonates; the plant of Oxo GmbH at Oberhausen-Holten is to be dismantled. 'Growing difficulties' in exporting nitrogen fertilisers are thought to be partly due to plant extensions regardless of private economic considerations which have been encouraged by governmental action; BASF have turned down several offers inviting capital participation in new fertiliser factories overseas.

The general outlook is viewed with considerable optimism by all three companies. Bayer report that orders received for chemicals in the first few months of 1958 were above the 1957 level; prospects for dyestuffs and pharmaceuticals are considered satisfactory, those for pesticides good, and the Agfa subsidiary is to increase its output of film and photographic paper. Hoechst say that sales in the first three months of this year were still 'very appreciably' higher than last year and plants continue to be fully utilised.

BASF state that sales in the first few months of 1958 were still higher than in the preceding year but the rate of increase for the whole year would probably not equal the 1957 rate because output was limited by capacity and it was not certain whether all important plants could be fully used this year; customers varied in their assessment of the market situation. On the other hand, BASF predict a further big jump in sales for 1959.

ICI Training Centre at Wilton Opened

A TRAINING centre planned, with extensions, to meet requirements for many years to come, was opened on 30 April at Wilton Works of Imperial Chemical Industries Ltd., by Sir Ewart Smith, F.R.S., a deputy chairman of ICI.

This will be the centre of a wide circle of training activities for all grades of employees, from apprentices to foremen and senior staff. In September this year a new scheme of training will be inaugurated—a commercial student apprentice scheme.

The staff of 32 in the Wilton works education department, which is housed in the new centre, is responsible for the training of 379 craft apprentices, 73 student apprentices and 192 laboratory assistants.

Chemist's Bookshelf

CHEMICAL ENGINEERING OF FLUID STATE

CHEMICAL ENGINEERING PRACTICE. Volume 4. Fluid State. Edited by *H. W. Cremer* and *Trefor Davies*. London: Butterworths Scientific Publications, 1957. Pp. xix + 623. 95s.

Three distinct treatises, each of absorbing interest, are contained in this volume.

It opens with a treatment of the thermodynamic properties of physical systems by R. F. Strickland-Constable. It is a fine addition to the texts on thermodynamics for chemical engineers and can be highly recommended for clarity both in exposition and referencing. This section has been written by one who appreciates the difficulties often encountered by the serious student and the treatment has sought to remove these by careful explanation at each stage in the evolution of the subject, even to the extent of introducing descriptions of mathematical procedures. An understanding of elementary thermodynamics is reasonably required in order that the more advanced aspects discussed here may be dealt with adequately.

The reader who has studied the subject, using the symbols and terminology of American texts for chemical engineers, might find the present symbolism rather difficult, at first reading. This is quite a minor limitation, however, for the author clearly differentiates between these points as they arise, so that a confluence of the two systems is achieved. The subject is treated in seven divisions.

Available Work

Section six deals with available work and also an outline of sum and difference properties (as may be encountered in extraction or distillation), whereas section seven is devoted to the thermodynamic principles of fluid flow. A complete list of symbols is given, as a conclusion. The author acknowledges his indebtedness to others, but he might well be pleased at his own contribution to the literature of chemical engineering thermodynamics.

N. L. Franklin and F. H. Cass are the authors of a comprehensive treatment of the transport properties of fluids. The discussion is initiated by consideration of aspects of fluid states, then on to types of flow and boundary layer theory, with its relationship to the transfer of heat and mass. These divisions are treated very fully, and the solutions to the complex equations which are so much associated with this subject are illustrated by the application of the methods of conformal mapping and relaxation procedures. An outline of dimensional analysis and of the principle of similarity is next presented, in a manner which will inspire further study.

Flow within tubes and ducts is the next division of the subject. It is practical and directly applicable to most of the problems which are regularly encountered. This is followed by an excellent chapter, well documented and referenced, which deals with flow around objects placed in a fluid stream. The final contribution of these authors is on the nature of flow of compressible fluids, a subject which must be treated thermodynamically. For this purpose, a terminology is used which might be confusing to the casual reader, unfamiliar with the subject. Examples are the use of the symbol I for enthalpy, and the return to the use of E as the symbol for internal energy; while uncommon terms are 'adiathermal' and 'homentropic'. The ounce molecular volume (22.4 c. ft. per oz. mole) which is employed in an illustrative calculation is a rather unusual unit. Although each division treated concludes with a full list of references, the whole is completed by the addition of a bibliography of 45 texts.

The final subject discussed in this volume is the measurement of process variables by A. Pollard and T. G. Carruthers. The subjects treated are pressure, flow measurement and temperature. The authors point out that the treatment is not intended to be exhaustive, but serves to illustrate the basic principles. Nevertheless, here is a practical guide to the choice of apparatus for these purposes. As might be expected the division devoted to flow measurement is rather complete, but this reviewer often feels that it is a pity that the remarkable Thomas meter, once so much valued as an accurate industrial instrument, does not now find a place in discussions on metering devices for gases. A select bibliography concludes the section.

A careful reading of this volume has revealed only two unimportant errors, which will be obvious to the reader. This is a real achievement in a work of this nature concerned with much complex mathematical material. Certainly this reviewer will return often to this work, in pleasurable anticipation. H. K. SUTTLE.

General Laboratory Practice for Organic Chemists

METHODEN DER ORGANISCHEN CHEMIE (Houben-Weyl). 4th edition. General Editor: *Eugen Müller*. Volume 1, Part 1: Allgemeine Laboratoriumspraxis. Georg Thieme Verlag, Stuttgart. 1958. Pp. xliv + 1,048. DM 198 (Subscription price DM 178.20).

At every stage in the history of organic chemistry new techniques of manipulating and separating organic compounds have played a major part in opening new avenues of progress. It is therefore appropriate that Volume 1 of the new edition of Houben-Weyl should be devoted to the tools of the organic chemist. The volume has been divided into two parts. The first covers constructional materials and methods of separation, and the second, which has not yet appeared, will include sections on vacuum and high pressure work, as well as discussions of other specialised techniques such as the manipulation of small quantities.

Laboratory work would be almost impossible without glass, and the first chapter in the present volume is rightly devoted to an authoritative account of the physical and chemical properties of various glasses. It includes brief discussions of glasses for special purposes such as the construction of glass electrodes. This is followed by short chapters on ceramics and on methods of connecting glass apparatus. Metals are discussed in greater detail, particular attention being paid to corrosion, and the resistance of metals to various reagents is summarised in a valuable table. The chapter on plastics includes a similar table, giving the relative stabilities of different products to inorganic reagents and organic solvents. Other chapters in the section on materials deal with adhesives, laboratory stands and the storage of chemicals.

The remainder of the book is devoted to methods of separation, beginning with accounts of decantation, filtration, washing, clarification and decolorisation. A brief section on emulsions will be consulted by many despairing organic chemists. Other short chapters give accounts of centrifuges, dialysis, electrodialysis, electrophoresis, concentration and mechanical aspects of drying (desiccants will be dealt with in Part 2). There is an excellent section on crystallisation, which provides an illuminating theoretical discussion as well as many valuable practical hints for dealing with difficult compounds. The chapter on distillation also strikes a good balance between theory and practice, and although the book as a whole is concerned with laboratory techniques rather than industrial methods, this chapter contains a brief account of the problems presented by some typical mixtures encountered in industry. High vacuum distillation and sublimation, including freeze drying, are discussed in a separate chapter.

Perhaps the most interesting and valuable chapters in this volume are those concerned with techniques of relatively recent origin. The reviewer was particularly impressed by the section on partition methods which provides an excellent theoretical survey, as well as detailed practical guidance on the choice of solvent systems. Other interesting chapters deal with inclusion compounds and prepara-

tive aspects of metal complexes. Adsorption chromatography and the adsorption of gases on solids are also discussed, but gas chromatography has been omitted on the grounds that it is, at the present time, of analytical rather than preparative interest. However, it seems unfortunate that this technique, which is used enthusiastically by so many organic chemists, has not found a place in the new Houben-Weyl.

An excellent section on ion-exchange resins deserves special mention. The related redox resins are still in their infancy, but the brief chapter on these substances should stimulate the investigation of their possibilities as organic reagents. The volume closes with a short, mainly bibliographical, section on laboratory design.

Much commercially available apparatus is enumerated and described throughout the book and, from the British reader's point of view, it is unfortunate that most of the models described are of German origin. Brief references to equivalent British and American types would have been helpful. A similar difficulty arises in the section on materials, where readers are referred to the German DIN standards without any mention of British Standards.

However, despite these limitations, this is clearly a very valuable book, and the quality of the contributions (all by acknowledged experts) maintains the high standard set by those volumes of the new Houben-Weyl which have already appeared.

PETER SCHWARZ

Complete Fundamental Data Provided on Oxo Process

HIGHER OXO ALCOHOLS. By *Lewis F. Hatch*. John Wiley and Son Inc., New York. Chapman and Hall Ltd., London. 1957. Pp. x + 110. 36s.

Since the process inappropriately named, but almost universally known as, the oxo reaction has been developed into one of the foremost commercial methods of producing higher alcohols, it is surprising that 20 years have passed from the time that Roelen in Germany took out the fundamental patents on the process until the publication of this first reference book devoted exclusively to the subject. Lewis F. Hatch's book is, therefore, very welcome in providing a most comprehensive review of the conditions and mechanism of the oxo reaction, together with the technology and uses of typical alcohols produced by the process.

The whole tenor of the book is to provide briefly, yet completely, the fundamental data on the oxo process from the time of its first discovery to its development up to the present time, and to do this the author has illustrated the course of the development by reference to the numerous patents which have been taken out over the period.

Brevity appears to be the author's watchword and, although a valuable and comprehensive list of references to these patents and any other literature is given at the end of the book to enable the student to carry out further study, in many instances a somewhat more extensive explanation of a patent development would have been welcome.

The chapter devoted to the reaction itself is the most important section of the book and appropriate emphasis is given to the reaction conditions, reaction variables, catalyst and the finishing treatment, fully supported by process data, much of which is published here for the first time. The discussion on catalyst preparation, composition and structure is excellent, reflecting the large amount of work on this subject, but the section on reaction mechanism would seem to show that although current theories are, in the author's words, 'on a firmer basis', more data are still required to confirm the mechanisms proposed.

Dealing with product utilisation, the author briefly covers the primary products from the reaction, the aldehydes together with derivatives such as oxo acids and aldol products, and concentrates on the more valuable commercial derivatives—the oxo alcohols. The most important outlet for these alcohols as esters for plasticiser use is well covered and convincing data are quoted in support.

In the section on detergent uses of oxo alcohols, which is otherwise well developed, an unnecessary amount of space is devoted to giving precise laboratory preparations for sodium tridecyl sulphate. The chapter on lubricant applications is disappointing, again because of brevity.

Summing up, this book provides a valuable source of reference for all those concerned with this important petrochemical process.

H. P. HODGE

First Course in Thermodynamics

AN INTRODUCTION TO CHEMICAL THERMODYNAMICS. By *E. F. Caldin*. Oxford University Press. Pp. xv + 424. 50s.

The aim of this book is to provide a first course in thermodynamics for university students of chemistry, in the second year of an honours course. The basis is deliberately simplified with this aim in view. Gases are treated as perfect, though activities are introduced from the start for solutions. Surface phenomena are barely mentioned, and the solid state is treated with brevity. Results of statistical thermodynamics are quoted without any attempt to detail their derivation. Strong electrolytes are treated in a summarising chapter which is however quite clear.

Users of this text book will find it helpful in familiarising themselves with chemical thermodynamics, in a broadly based way that should permit more advanced work to follow on adequate foundations. Symbols are carefully chosen and defined and the author takes pains, evidently based on teaching experience, to clear up many difficulties associated with the more abstract concepts of thermodynamics. The inclusion of illustrative experimental results helps to give concreteness to the text.

However, there are no working examples; without such exercises students of thermodynamics will never learn to use it as an applied science, with real confidence.

On the other hand, some appreciation of what has been termed 'the power and beauty' of thermodynamics calls for a somewhat more mathematical approach than this text aims to give. Despite these limitations, which can be met by more specialised books, students of chemistry will find this a very useful first text book of thermodynamics.

References to further reading are fairly numerous, and teachers using this text book would find it necessary to guide their students to make an effective selection.

A. R. UBBELOHDE.

Final Volume in Terpene Series

THE TERPENES. Volume V. By *Sir John Simonsen* and *W. C. J. Ross*. The University Press, Cambridge. 1957. Pp. ix + 662. 84s.

Since the publication of the first volume of this series in 1931, the appearance of each new part has been eagerly awaited by all workers in the terpene field. There is no doubt that this final volume will prove equally indispensable to them.

Volume V deals with the triterpenoid hydroxy acids, hydroxy lactones, hydroxyaldehydo acids and hydroxyketo acids, describing the isolation, physical properties, structure determination and general reactions of each member of the group. Together with its companion, volume IV, it summarises the chemistry of all the triterpenes known at the end of 1953.

I would venture one suggestion; that sterically significant formulae might have been used with advantage in several places in the text. However, the inclusion of an excellent summary of the elucidation of the stereochemistry of the basic triterpene skeletons, and their substituent groups does much to remedy this minor omission.

The addenda to volume III, in this book, deals with advances made since 1949 in the chemistry of the sesqui- and di-terpenes. Indeed, since that date the nature of this subject has been changed considerably by the discovery and investigation of a series of lactones and compounds containing furan rings and rings of up to 11 carbon atoms.

I can offer no higher testimony to the usefulness of these volumes, than to say that the research worker or the student looking for information about terpenes invariably consults 'Simonsen' first.

R. HODGES

Chemist's Bookshelf

Well-documented Guide to the Carbohydrates

THE CARBOHYDRATES—CHEMISTRY, BIOCHEMISTRY, PHYSIOLOGY. Edited by *Ward Pigman*. Academic Press, New York. 1957. Pp. xvii + 902. $20.

Recent publicity given to surface-active agents derived from sucrose reminds us that this substance is an important industrial raw material which still awaits thorough exploitation. 'Chemistry of the Carbohydrates' by Pigman and Goepp, which was first published in 1948, was one of the first monographs in the field to emphasise the industrial importance of carbohydrates, as well as their significance for chemists and biologists.

The book has now been completely rewritten by a team of contributors and the resulting volume is a new book rather than a second edition. In particular, as is indicated in the sub-title, far more space has been devoted to the biochemical and physiological aspects of the subject.

The new volume opens with two chapters by the editor and J. Sowden which deal in a general way with the structure, stereochemistry, properties and synthesis of the monosaccharides. These are followed by an excellent survey of esters, glycosides and acetals by M. L. Wolfrom and A. Thompson; this includes a brief but valuable section on phosphate esters (W. Z. Hassid and C. E. Ballou). Polyols, both acyclic and cyclic, are discussed by R. L. Lohmar, and oxidation products of monosaccharides by J. W. Green. Ethers, anhydrosugars and unsaturated derivatives, the playground of many academic carbohydrate chemists, are surveyed by J. C. Sowden and the nitrogenous derivatives, which are of importance to food technologists as well as to biochemists, are reviewed by the editor.

W. Z. Hassid and C. E. Ballou provide an excellent section on oligosaccharides which deals with enzymic aspects as well as structural details. The polysaccharide chapter (R. L. Whistler, W. M. Corbett, Ward Pigman and David Platt) is somewhat shorter than in the earlier volume and some readers may regret that space did not allow more detailed discussion of the classical structural chemistry of important polysaccharides. Other chapters deal with naturally occurring glycosides and glycosidases, the identification and determination of carbohydrates (including histochemical aspects), photosynthesis and carbohydrate metabolism, and the role of carbohydrates in nutrition.

Taken as a whole, this book is a most valuable contribution to the carbohydrate literature. In a composite work like the present volume it is perhaps inevitable that some of the sections should fall below the general standard in clarity of presentation and validity of emphasis.

A rather more serious fault is that certain sections contain a number of errors which could have been avoided by careful thought and a closer examination of recent literature. Thus on p. 350 we find the ill-considered statement that ethylene glycol can be used to destroy excess oxidant before the estimation of formaldehyde produced in periodate oxidations. The alleged example of the 'cis-fission' of an oxide ring given on p. 394 was exploded in 1954 and the formula for thiolglucoxazoline on p. 417 was revised in the same year.

However, despite these faults, this is undoubtedly a most useful book. It makes stimulating reading and can be recommended to both chemists and biologists as a well-documented guide to a most varied subject.

PETER SCHWARZ

Avoiding Radioactive Contamination

SAFETY TECHNIQUES FOR RADIOACTIVE TRACERS. By *J. C. Boursnell*. Cambridge University Press, London. 1958. Pp. xii + 68. 7s 6d.

It is an established fact that the manipulation of radioactive material may be hazardous to the health of the worker if suitable precautions are not taken. Contamination of counting equipment and laboratory ware, usually inadvertent, may also occur, resulting in the invalidation of experiments and considerable waste of time. By careful planning and the knowledge and observation of a simple but essential drill, however, both types of contamination may be avoided.

The aim of this little book is primarily to set out elementary precautions which should be taken by anyone handling radioactive substances. It consists of seven chapters. As an introduction the author deals with the types of radiation and units, and the principal methods normally employed, i.e. film badges, ionisation chambers and blood counts, to check the dose received by the worker. It is somewhat surprising, however, in this connection to find 'blood counts' recommended. Experience would tend to indicate that a very large dose indeed would have to be received before the blood shows any marked changes.

In the third chapter personal contamination by accidental ingestion and contamination of the hands is considered. In the latter section it is recommended that where contamination cannot be removed by soap alone, scrubbing with a nail brush and soap or pumice stone should be carried out. This treatment, although successful, can take a long time with painful consequences to the skin. It is, therefore, disappointing to find that Dr. Boursnell has nothing to say of rapid hand-decontaminating solutions like permanganate or Teepol-citric acid mixture.

In a chapter entitled 'Contamination and cleanliness', the contamination of apparatus, and radiation screening among others are included. The final chapters of the book discuss the disposal of radioactive waste and laboratory administration, and a convenient summary of the 'do's' and 'don'ts' for safe work is given.

Nine appendixes include the classification of radioactive isotopes by toxicity, illustrations of protective equipment, temporary shielding for radioactive substances and dose levels to the individual. A bibliography of 47 references is given but no index. This book fulfils its aims. For those taking up work employing radioactive substances it will be a useful and practical introduction to a necessary drill.

R. J. MAGEE.

25 Years' Research Work by RABRM

EBONITE. By *J. R. Scott*. Maclaren and Sons Ltd., London. 1958. Pp. 293. 50s.

This book is an unusual one in so far as it is not intended, like so many recent bibliographies, to provide a complete survey of the literature dealing with its subject but only a record of the activities of one research organisation over the past 25 years. This restriction would be a serious drawback in most books but as most of our knowledge of ebonite has been produced by the organisation in question, the Research Association of the British Rubber Manufacturers, it is not the case here.

It is essentially a practical book with the presumed object of giving the ebonite manufacturer the maximum of 'know-how' and promoting the manufacture of better ebonite. No attempt has been made to discuss in any great detail the structure of ebonite or its modes of degradation under the influence of light and humidity. Instead attention has been focused on the means of preventing such deterioration by the use of antioxidants and pigments. It seems unfortunate however, that such an outlook may bar the general reader by the use of trade terminology. Additional information would have helped to create a more satisfying picture to those unfamiliar with the product. As an example the change in surface properties is discussed without any reference to or picture of the microscopic surface structure.

The first two chapters describe the manner in which ebonite is made and give a superficial account of its structure.

There follows an account of surface deterioration and the swelling action of solvents. Manufacture is then discussed in more detail and the variation in physical properties with the time and temperature of cure, the rubber to sulphur ratio, the inclusion of fillers, accelerators and activators and with the type of rubber used. Many compounding recipes are included together with graphs and tables of electrical and mechanical properties so that the book will be very valuable to those engaged in the ebonite trade. It cannot, however be recommended to the average chemical reader except as a source book.

Tht author is to be congratulated on having the most complete indexing system which has appeared for a long time.

J. R. MAJER.

People in the NEWS

● MR. STANLEY J. DAVIES, chairman and joint managing director of A. Gallenkamp and Co. Ltd., has been elected president of the British Lampblown Scientific Glassware Manufacturers' Association in succession to MR. I. B. THRONSDEN. MR. P. J. EDWARDS, managing director, Franco-British Glass Co., and MR. H. V. STOUT, managing director, H. Stout and Co. Ltd., were elected vice-presidents.

● MR. REGINALD GEORGE HOARE, whose appointment to the board of the pharmaceutical division of Imperial Chemical Industries Ltd. was announced in last week's issue (page 842), joined ICI (China) Ltd. in the pharmaceutical division in 1946. In 1948 he took charge of the Hong Kong office of ICI (China) pharmaceuticals department and in 1950 was appointed a deputy local director of ICI (Export) Ltd., Djakarta. Returning to the UK in 1953 he was appointed assistant to the overseas sales manager of the pharmaceuticals division and in March 1956 became commercial services manager.

R. G. Hoare

● DR. T. H. M. KERFOOT, of Thomas Kerfoot and Co. Ltd., has been elected president of the Association of British Pharmaceutical Industry. Vice-president is MR. E. D. CAREY, ICI Ltd., and hon. treasurer is MR. G. T. MORSON, of Thomas Morson and Sons Ltd.

● The Castner gold medal was presented to DR. R. HOLROYD, a deputy chairman of ICI Ltd., in the department of chemistry, King's College, Newcastle upon Tyne, on 30 April. Dr. Holroyd then gave his Castner memorial lecture entitled 'The development of the petroleum chemical industry in Britain'.

● MR. R. F. SIMMONS, who was with the Kestner Evaporator and Engineering Co. Ltd., has been appointed sales manager to Appleton and Howard Ltd., at the company's London office at Mayfair House, 9 Hertford Street, London W1.

● MR. B. E. HOPKINS and DR. E. C. POTTER have been awarded 150 guineas each by the administrators of the Sir George Beilby memorial fund, representing the Institute of Metals, the RIC and the SCI.

Mr. Hopkins has received the award in recognition of his work in physical metallurgy, with special reference to the effect of alloying elements in high-purity iron on the mechanical properties at temperatures covering the tough-to-brittle transition range under tensile and notch impact conditions. Mr. Hopkins is a principal scientific officer in the metallurgy division of the National Physical Laboratory.

The award goes to Dr. Potter for his work on electrochemistry and the corrosion of metals, with special reference to the internal corrosion of power station boilers and the analysis of boiler waters for solutes at great dilution. Dr. Potter works at the Paint Research Station at Teddington; he is the author of 'Electrochemistry: Principles and Applications,' and is the hon. recorder of the corrosion group of the SCI.

● MR. W. R. TOMLINSON is to retire, when he reaches the age of 55 on 12 June, from his positions as director and general manager of Reed Corrugated Cases. MR. F. J. CLARK, formerly managing director of British Oxygen, will become managing director with effect from 1 June. MR. P. G. WALKER will remain chairman.

● MR. W. MORGAN THOMPSON, M.P.S., managing director of Miles Laboratories Ltd., 41 Piccadilly, London W1, makers of Alka-Seltzer, has been appointed deputy chairman.

● MR. H. W. FENDER, M.Inst.B.E., A.C.I.S., vice-chairman and managing director of Prodorite Ltd., was elected chairman of the British Chemical Plant Manufacturers' Association for the ensuing year at the annual meeting on 1 May. Mr. Fender has been a member of the BCPMA council and executive committee since 1951, and was a vice-chairman from 1954 to 1956. Other elections were: Vice-chairmen, N. C. Fraser (W. J. Fraser and Co. Ltd.), Dr. R. Lessing (Hydronyl Syndicate Ltd.), P. W. Seligman (APV Co. Ltd.),hon. treasurer, M. Wyndham (Bennett, Sons and Shears Ltd.); council, J. Bishop (Nordac Ltd.), J. C. Haithwaite (John Thompson (Dudley) Ltd.), I. M. O. Hutchison (Henry Balfour and Co. Ltd.), B. H. Turpin (QVF Ltd.), and M. Wyndham (Bennett, Sons and Shears Ltd.).

● MR. K. J. LIVETT has joined the new associate of Elga Products Ltd., Deionisation (Elga) Ltd. (see p. 886) as general manager. He was previously export liaison officer of Edwards High Vacuum Ltd.

● MR. H. GOODLAND has relinquished his position as general manager of the United Sulphuric Acid Corporation plant at Widnes in order to take up an appointment in British Guiana. His successor is MR. JOHN B. POINDER, who was previously production manager. Previously he was an industrial chemist at the ICI salt division.

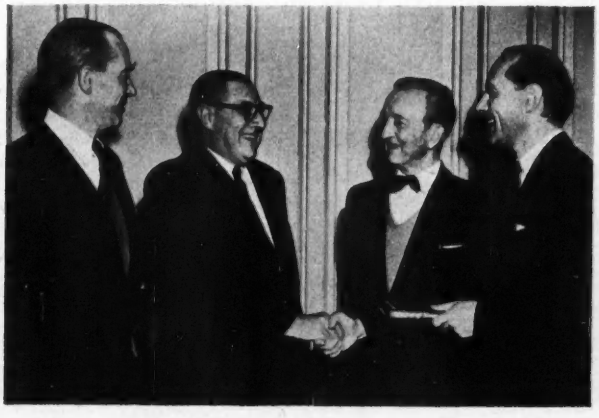
● DR. DAVID E. JONES, president of the Electric Reduction Co. of Canada Ltd. and DR. HOWARD W. STRONG, chairman and managing director of Albright and Wilson (Australia) Pty. Ltd. attended an international development conference held by Albright and Wilson Ltd. in London on 31 April and 1 May.

Dr. Jones was accompanied by ERCO's vice-president in charge of research and development, MR. R. M. O. MAUNSELL, and by DR. J. H. E. JEFFES, head of ERCO's technical service department. Albright and Wilson directors present included the chairman, MR. S. BARRATT, MR. W. K. Æ. PIERCY, and MR. F. SCHON, chairman and managing director of Marchon Products Ltd.

● MR. F. G. PENTECOST has been appointed chairman of Shawinigan of the UK, a member of the Shawinigan Water and Power Co. Group of Canada. He succeeds MR. R. H. COLLIS, who has retired from the board. MR. V. P. BROOKS has been appointed a director of the UK company. Mr. Pentecost, who was vice-chairman, has been on the board since 1953. He is also chairman of A. Boake Roberts and Co. Ltd.

● DR. DAVID JOHN MANNERS has been awarded the Meldola medal for 1957, in recognition of his research work, especially in the field of polysaccharide chemistry using physico-chemical and biological methods. Educated at Fitzwilliam

(*continued on page* 886)



Mr. F. F. Heath, sales manager of Brotherton and Co. Ltd., has retired after 43 years with the company. At the presentation of a bracket clock last week were, l. to r., Mr. W. F. Dunnett, director Mr. Heath, Captain B. L. Brotherton, former chairman, and Mr. George Brotherton Radcliffe, chairman

TRADE NOTES

Ethylene Urea Production

Whiffen and Sons Ltd. will shortly have available increased quantities of ethylene urea from additional plant now being installed. Total capacity will cover the needs of the UK, with a surplus for export markets.

Hycar Rubbers in UK

Production for the first time in Britain of a full range of Hycar synthetic rubbers based on butadiene/acrylonitrile copolymers, is announced by British Geon Ltd. Four grades will be made, Hycar 1001 and 1041 which are high acrylonitrile copolymers, and Hycar 1002 and 1042 which have a medium-high acrylonitrile content.

Fluorine-containing Alcohols

Brown and Forth Ltd., Clifton House, 83-117 Euston Road, London NW1, announce that their principals, E.I. Du Pont de Nemours and Co. Inc., US, have developed a new series of high solvency fluorine-containing alcohols that are claimed to provide a convenient means of introducing fluoroalkyl groups into an organic molecule. It is stated also that they show promise as intermediates in the development of new plastics, surface active agents, lubricants, elastomers and plasticisers claimed to have exceptional thermal and chemical stability.

Elga Associate

Elga Products Ltd. have formed an associated company, Deionisation (Elga) Ltd., to cover home sales and service of industrial units. This is stated to be due to the rapid expansion of the company's ion exchange division, which will in future confine its activities to applications for research, pilot plant and education only.

Candy Filter Co.

From 1 June the chemical pump division of Candy Filter Ltd. will operate as a separate company under the name of 'Metering Pumps Ltd', at 21 The Mall, Ealing, London W5.

Chemicals Exempted from KID

THE Treasury have made an Order under section 10 (5) of the Finance Act, 1926, exempting the following articles from Key Industry Duty until 18 August 1958:

Scientific glassware, tubing of neutral glass, not being (1) glass with a content of more than 85 per cent of silica and boric oxide together nor (2) glass of fused silica or fused quartz, in straight lengths having an external diameter of not less than 8 mm. and not more than 35 mm. and a wall thickness of not less than 0.3 mm. and not more than 1.5 mm., and being capable of passing a test corresponding with the test for limit of alkalinity of glass prescribed by British Pharmacopoeia 1953.

p-Aminobenzoic acid.

Androst-5-en-3β-ol-17-one acetate.

mono-Chloroacetone.

OO-Dimethyl methylcarbamoylmethyl phosphorodithioate (a methyl ester).

p-Dioxan-2:3-dithiol di-(*OO*-diethyl phosphorodithioate) (an ethyl ester).

Diphenyl *o*-phthalate (a hydroxybenzene ester).

n-Dodecane-1-thiol.

Formamide.

Manganese ethylenebisdithiocarbamate (a salt of a substituted dithiocarbamic acid).

Methylhydroxyethylcellulose of which not less than 90 per cent by weight passes a sieve having a nominal mesh of 30 and of which not more than 20 per cent by weight passes a sieve having a nominal mesh number of 72, both of which conform to British Standard 410:1943.

6-Methyl-α-ionone.

1:5-Pentamethylenetetrazole.

Sodium fluoride, which does not contain impurities equivalent to more than 5×10^{-9} grammes of U_3O_8 per gramme, and of which 1 gramme does not contain impurities capable of depressing the estimation of U_3O_8 by more than 1×10^{-8} grammes, when determined fluorimetrically.

Tolylene-2:5-diamine sulphate (a tolylene diamine salt).

Qualified Scientists—Ministry to Hold Enquiry

Asked what enquiries are at present being conducted to ascertain the distribution of research scientists in industry, Mr. H. Nicholls, Parliamentary Secretary to the Ministry of Works, said that it was planned to carry out a second enquiry into the number of qualified scientists and engineers employed in Great Britain similar in scope to the enquiry carried out in 1955-56.

BSI Suggest names for Common Pesticides

SUGGESTED new names for some common pesticides have been published by the British Standards Institution. They are as follows:

Proposed common name	*Chemical name*
chlorpropham	*iso*propyl *N*-(3-chlorophenyl)carbamate
dimeturon	dimethylphenylurea
dinoprop	dinitroisopropylphenol
disul	2-(2:4-dichlorophenoxy)ethyl hydrogen sulphate
disul-sodium	sodium 2-(2:4-dichlorophenoxy) ethyl sulphate
diuron	*N*-3:4-dichlorophenyl-*N'N'*-dimethylurea
griseofulvin	7-chloro-4:6:2'-trimethoxy-6'-methylgris-2'-en-3:4'-dione
oxytetracycline	4-dimethylamino-1:4:4a:5:5a6:11:12a-octahydro-3:5:6:10:12:12a-hexahydroxy-6-methyl-1:11-dioxo-2-naphthacenecarboxamine
quintazene	pentachloronitrobenzene
simazin	2-chloro-4:6-bis(ethylamino) symmetrical triazine

Comments on these names are welcomed and should be sent to Mr. R. K. Thomas, British Standards Institution, 2 Park Street, London W1, to arrive before 25 June.

People in the News

(*continued from page* 885)

House, Cambridge, Dr. Manners started research on the molecular structure of glycogen under Dr. D. J. Bell of the biochemistry department in 1949. In 1951 he visited the Institute Pasteur, Paris, to study microbiological techniques and after receiving his Ph.D. in 1952, he was appointed to his present position of lecturer in the chemistry department of Edinburgh University. With the encouragement of Professor E. L. Hirst, he has continued and extended his researches on the chemistry and biochemistry of carbohydrates.

Market Reports

Demand Remains Quiet

LONDON The demand for industrial chemicals has been quiet during the past week and the market generally has been uneventful with buyers hesitant to cover more than nearby requirements. Nevertheless, the movement on home account against contracts continues to be satisfactory.

The seasonal demand for agricultural chemicals has followed the usual course with sulphate of ammonia in good request on home and export account.

A good flow of overseas enquiry for chemicals is in circulation and completed business is reasonably good though less in volume than for the same period in 1957. Shipments of crude tar and pitch are reported to be on a smaller scale than of late.

MANCHESTER Steady price conditions in most sections of the trade continued on the Manchester chemical market. Most branches of the textile trade are indifferently employed and this is reflected in the demand for a rather wide range of heavy chemicals. One or two other outlets are less busy, but otherwise contract deliveries are on a reasonably steady scale.

GLASGOW Trading in the Scottish heavy chemical market, from a rather moderate opening, did show signs of improvement towards the end of the week. Demands were for quite a varied range of chemicals, while those requirements against contracts have been satisfactorily maintained. Prices remained steady, showing little change. There has been considerable activity during the past week in agricultural chemicals, particularly for demands against orders placed earlier in the season.

DIARY DATES

TUESDAY 13 MAY

SCI Plastics & Polymer Group—London: 14 Belgrave Square SW1. 6.30 p.m. 'Grafting on rubber by high energy irradiation' by D. T. Turner.

WEDNESDAY 14 MAY

RSA—London: Royal Society of Arts, John Adam Street, Adelphi WC2. 2.30 p.m. The Pope Memorial Lecture 'Expanding horizons in organic chemistry' by Sir Ian Heilbron.

SCI Food Group—London: 14 Belgrave Square SW1. 6.15 p.m. Annual general meeting. Followed by address by Sir Harry Jephcott.

FRIDAY 16 MAY

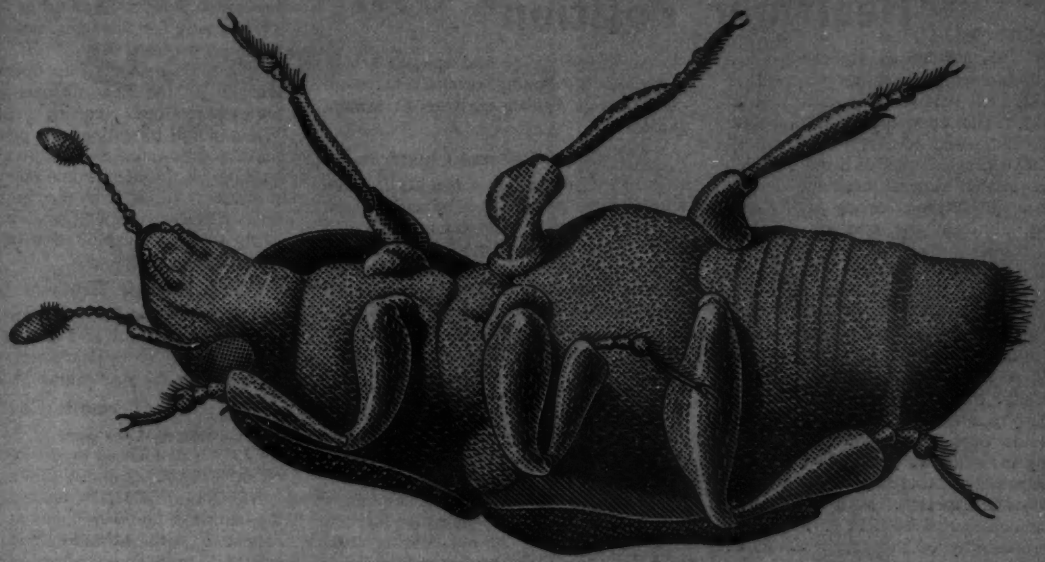
RIC & SAC—Blackpool: Redmans Park House Hotel, North Promenade. 7.30 p.m. 'The micro vacuum fusion determination of gases in metals' by M. R. Everett, 'The chemical determination of nitrogen in reactor metals' by J. A. Ryan, 'The determination of naturally occuring radioactive impurities in a uranium purification process' by M. R. Hayes and 'A simple manometric method for the determination of carbon in metals' by M. R. Everett.

SAC—Aberdeen: Chemistry Dept., King's College. 7.30 p.m. 'The analysis of clays using ion-exchange resins' by Mrs. Jean McAuslin and 'The application of gamma radiation to the non-destructive testing of coal' by J. Craig Higgins.

SCI Fine Chemicals Group—London: 14 Belgrave Square SW1. 6.30 p.m. Annual general meeting. 7 p.m. Paper by B. A. Hems, chairman of the group.

Society of Cosmetic Chemists—London: 55 Park Lane W1. 7.30 p.m. Annual general meeting.

Deadly to insects



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Commercial News

Amber Chemicals Show 'Healthier Position'

THE 1957 account of Amber Chemical Industries Ltd. shows a profit of £17,472. In 1956 there was a loss of £34,102. The company therefore have had a turn-round of £51,574. Mr. D. G. N. Lloyd-Lowles, the chairman, stated at the annual general meeting, that in every section of the company profits were earned, although the cost of development of new projects had not yet been entirely absorbed in the accounts.

Net assets, including reserve for future income tax had improved from £122,902 to £141,384, and net current assets now showed a surplus of £90,137 over current liabilities as against £64,144 last year. Generally, the financial position of the company was healthier than it had been for some time, the chairman reported. During the next two years however, capital expenditure totalling approximately £50,000 was expected. Such expenditure as was considered essential to increasing the profitability of the group would be met partly by facilities arranged with the bank and partly out of profits.

Amber Chemical Co. Ltd., is responsible for the manufacture and merchanting of Amber liquid fuel improvers and combustion additives for use in solid and liquid fuel fired installations. Chas. H. Windschuegl Ltd. has continued to progress and the institution of fresh uses for Kieselguhr suggests the possibility of more rapid expansion in the future.

With regard to the first four months of the current year, Mr. Lloyd-Lowles said that both trade and profits had shown further improvements. They have budgeted for a profit in excess of that for the year ended 31 December, 1957, and figures show that the company is proceeding as planned.

One year's arrears of dividend on the preference shares was paid in December last. The company proposed to make progressive reductions in the arrears as rapidly as possible, having regard to profits and the company's financial position.

Bakelite Ltd.

Total sales by Bakelite Ltd. for 1957, both in value and in weight were a record, says chairman Mr. H. V. Potter, in his annual report. In spite of increased efficiency, however, costs have continued to rise but these have not been passed on owing to the very competitive conditions, both at home and abroad.

Bakelite's market for polyethylene has continued to increase and now that the new Grangemouth plant has come into operation, a further expansion in this field is hoped for.

A large part of the research and development departments' work has been concerned with the company's latest products, e.g. polythene and epoxide resins.

Details of trading profits, etc., were published in CHEMICAL AGE, 22 March, p. 561.

British Chrome and Chemicals

British Chrome and Chemicals, which amalgamated with Brotherton and Co. last December, propose changing their name to Associated Chemical Companies Ltd., and to amend the articles, including those dealing with directors' remuneration.

Chairman, Mr. M. J. C. Hutton-Wilson, in his report, states that work has started on new projects at Glasgow and at the Eaglescliffe works of British Chrome and Chemicals (Holdings) which account for a large proportion of the authorised £1,869,621 capital expenditure. Group sales increased by 11 per cent in 1957; whereas profits before tax were only up by 6 per cent. Conditions became progressively more competitive, particularly in export markets which account for 20 per cent of total sales. (For details of profits and dividend, see CHEMICAL AGE, 3 May, p. 842.)

The report indicates that a decline in trade, allied to financial restrictions in the home market, appears to be causing consumers to reduce stocks to an absolute minimum.

Results for the first few months of the current year are stated to be not so favourable as for the corresponding 1957 period.

Glaxo / Allen and Hanburys

Unanimous acceptance is recommended by the directors of Allen and Hanburys of the offer from Glaxo Laboratories to acquire all the 488,400 ordinary £1 shares on the basis of three Glaxo 10s ordinary for each Allen and Hanbury ordinary share. This offer is conditional upon 90 per cent acceptance by 30 May or such lower percentage or later date as Glaxo may decide.

Fisons Ltd.

Fisons Ltd. have now fixed the terms of the 'rights' issue of ordinary £1 shares announced last November. Provisional allotment of 1,934,954 of these shares on a one-for-three basis to ordinary shareholders has been made. The new shares have been priced at 31s 3d each. The issue will raise just over £3 million.

This sum and existing cash resources, states the board, will suffice for the completion of projects already approved, which are now standing at £5½ million, and will leave the group with adequate working capital.

The new shares will not participate in the interim ordinary dividend in respect of the year ending 30 June, but will rank for any final dividend declared. In the absence of unforeseen circumstances the final should be 10 per cent on the increased capital, thus maintaining the total rate of dividend on the existing ordinary at 15 per cent, the rate paid for the three preceding years.

From latest estimates available to the board, group trading profit and investment income may be slightly less than last year. There will also be an increase of £185,000 in the charge for interest on the unsecured loan stock raised at the end of 1956 largely for financing new assets not yet in production.

Scheduled to come into operation this autumn is the new nitrogen plant at Stanford-le-Hope costing £4,250,000. When in full operation, this plant should make a substantial contribution to group earnings, it is stated. Some new chemical products resulting from the company's increased research expenditure are expected to be ready for exploitation in the near future.

McKechnie Brothers Ltd.

McKechnie Brothers Ltd. have declared an interim dividend of 5 per cent on the ordinary and A ordinary shares of the company for the year ending 31 July 1958.

The Permutit Co.

An unchanged dividend of 15 per cent for 1957 is announced by the Permutit Co. on the £750,000 Ordinary capital.

After tax of £221,250, against £230,250, the company's profit is lower at £210,945, compared with £248,663, but the subsidiaries' profits rose from £25,324 to £96,042, after depreciation and £82,782, against £11,836, for overseas tax.

The profits of the subsidiaries have been carried forward in their accounts. The company is placing £140,000, against £165,000, to general reserve.

Wright Layman

Although trading profits, etc., of Wright Layman and Umney, manufacturing chemists and wholesale druggists, show little change at £102,495 against £102,415, the dividend is being raised on the £90,000 Ordinary from 10 per cent to 15 per cent for 1957, with a final of 12½ per cent (7½ per cent). The company also announce a proposed one-for-nine free scrip issue.

Depreciation absorbs £10,832 (£9,253), directors' fees £1,526 (£1,000), advertising expenditure £20,110 (nil) and tax £44,678 (£50,558).

Ketjen NV

The Dutch company, Ketjen NV, Amsterdam, producers of sulphuric acid, report a net profit for 1957 of Fls.3,731,000 (Fls.2,081,000). A dividend of 10 per cent is being paid for the year. The company recently announced the formation of a new company, Cyanamid-Ketjen NV, in co-operation with American Cyanamid Co., New York (CHEMICAL AGE, 19 April, p. 732).

Sandoz

Gross trading profit of the Swiss pharmaceutical company, Sandoz, in 1957 increased by Swiss Frs.561,803 to Frs.52.1 million. Net profit is Frs.16.59 million, an increase of Frs.208,522. Income from participations, etc., increased by Frs.1.29 million to Frs.7.88 million. A dividend of 5 per cent and further Frs.75 gross per share is announced.

FIRST OF ITS KIND

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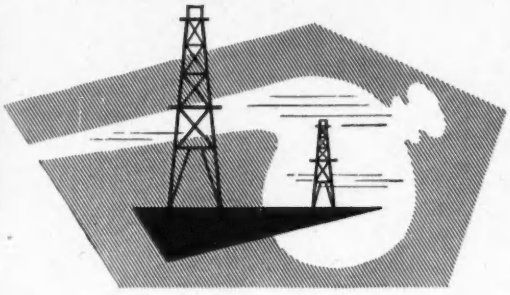

An outstanding development in British industry in the last twenty years has been the expansion of the Petroleum refining and Chemical Industries. The Chemical and Petroleum Engineering Exhibition—the first of its kind—will present dramatic evidence of the tremendous achievements that have been made.

At Stand after Stand, contractors, designers and specialists in every branch of British chemical and petroleum engineering will have something to show of vital interest.

The Exhibition will also include a conference on "The Organisation of Chemical Engineering Projects" arranged by The Institution of Chemical Engineers and The Institute of Petroleum; and films will show how the Chemical Plant and Petroleum Equipment Industries have helped in the development of their consumer industries.

A visit to this Exhibition is a MUST to all concerned in chemical and petroleum projects and to everyone whose industry is in any way influenced by such projects.

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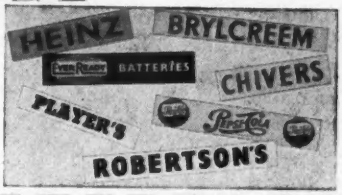

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By permission of the Controller, HM Stationery Office, the following extracts are reproduced from the 'Official Journal (Patents)', which is available from the Patent Office (Sale Branch), 25 Southampton Buildings, Chancery Lane, London WC2, price 3s. 3d. including postage; annual subscription £8 2s.

Specifications filed in connection with the acceptances in the following list will be open to public inspection on the dates shown. Opposition to the grant of a patent on any of the applications listed may be lodged by filing patents form 12 at any time within the prescribed period.

AMENDED SPECIFICATIONS

Copies will be on sale 28 May or as soon as possible thereafter

Refining oils containing benzene. Scholven Chemie AG. **692 639**

Titanium base alloys. Berry, R. L. P., and anr. **738 882**

Titanium base alloys. Imperial Chemical Industries, Ltd., and anr. **741 003**

Crimped threads or fibres of polymeric e-caprolactam. Farbwerke Hoechst AG. **750 652**

Melt spinning of synthetic organic polymers. Perfogit Soc per Azioni. **760 316**

Copies will be on sale 4 June or as soon as possible thereafter

Naphthalene compounds. Roche Products, Ltd. **752 420**

Ion-exchange resins. National Research Development Corp. **767 821**

Phosphates of reduced fluorine content. Fisons, Ltd. **783 280**

ACCEPTANCES

Open to public inspection 4 June

Rendering articles of polymethylene terephthalate resistant to the growth of fungi and bacteria attack when a nutrient source is present. Imperial Chemical Industries, Ltd. **796 107**

Process and device for applying catalytic combustion to heat-exchangers. Huet, A. **796 108**

Penicillin salts. Imperial Chemical Industries, Ltd. **795 934**

Method of de-oxidising oxidised cobalt-nickel iron alloy surfaces. Philco Corporation. **795 980**

Benzoic-acid - 4 - sulphonamides. Farbenfabriken Bayer AG. **795 937**

Waterproofing process. Monsanto Chemicals, Ltd. **796 140** **796 141**

Substituted hydantoins. Imperial Chemical Industries, Ltd. **796 069**

Streptomycin salt. Instituto Luso Farmaco D'Italia Soc. R. L. **795 941**

Dehydrostreptomycin salt. Instituto Luso Farmaco D'Italia Soc. R. L. **795 942**

Method of and apparatus for carrying out physical and chemical process in which gases, liquids and solids take part at the same time. Metallges, AG. **796 195**

Alkoxysilylpropylamines. Union Carbide Corp. **795 894**

Alkylene diamines. Merck & Co., Inc. **795 988**

Terephthalic acid and a salt thereof. Imperial Chemical Industries, Ltd. **796 197**

Production of moulded articles by a dipping process. Farbenfabriken Bayer AG. **796 199**

Apparatus for carrying out chemical or physical processes involving finely divided solids and gases. Badische Anilin- & Soda-Fabrik AG. **796 200**

Polyenic aldehydes. Celanese Corp. of America. **795 990**

Apparatus for continuously separating, by flotation, fibrous materials suspended in a liquid. Leje & Thurne Aktiebolag. **795 992**

Low temperature copolymerisation of olefins and diolefins. Esso Research & Engineering Co. **795 899**

Light sensitive diazotype layers containing waxes. General Aniline & Film Corp. **796 117**

Apparatus for contacting a liquid with another fluid. Universal Oil Products Co. **796 078**

Monochloroacetic acid. Shawinigan Chemicals, Ltd. **795 903**

Alkali metal silicates. Henkel & Cie, Ges. **795 904**

Derivatives of precalciferol and process for its production. Uclaf. **796 144**

Purification of liquids containing suspended particles. Krofta, M. **795 944**

Polyurethane elastomers. Du Pont de Nemours & Co., E. I. **796 043**

Dyeing wool and dyestuff preparations therefor. Ciba Ltd. **795 946**

Fluorescent stilbene derivatives. Sandoz, Ltd. **796 211**

Glass batches. Soc. Anon. des Manufactures des Glaces et Produits Chimiques de St.-Gobain, Chauny & Cirey. **796 035**

Oxidising alkyl substituted pyridines. Aries, R. S. **796 036**

Removal of volatile ingredients from thermoplastic polymers. Dow Chemical Co. **795 999**

Manufacture of iron oxide pigments. Cabot, Inc., G. L. **796 037**

Stabilised polyolefinic compositions. Dow Chemical Co. **796 003**

Hydrocarbon conversion process. Naamlooze Vennootschap de Bataafsche Petroleum Maatschappij. **796 085**

Conversion of hydrocarbons. Naamlooze Vennootschap de Bataafsche Petroleum Maatschappij. **796 048**

Recovery of iodine from hydrogen iodide. Naamlooze Vennootschap de Bataafsche Petroleum Maatschappij. **796 049**

Preparation of decacyclene. Rutgerswerke-AG. **796 005**

Unsaturated alkyl resins. United States Rubber Co. **796 006**

Steroid ester, its salts and pharmaceutical compositions containing them. Syntex Soc. Anon. **796 007**

Oxidation of ferrous hydroxide. Dewes, E. **796 213**

Manufacturing polyesteramides. Beck & Co. Ges. **796 008**

Insecticidal compositions. Badische Anilin- & Soda-Fabrik AG. **795 918**

Aziridino-acylamino-quinones. Farbenfabriken Bayer AG. **796 218**

Supply installation for apparatus treating pulverulent material. Hermanns, W. **796 127**

Halosalicyclolamidoanthraquinones. American Cyanamid Co. **795 919**

Polyalkylindanes. Polak's Frutal Works, Inc. **796 130**

Derivative of precalcifericol. Uclaf. [Divided out of 796 144.] **796 115**

Polymers of unsaturated bicyclic compounds. Imperial Chemical Industries, Ltd. [Divided out of 796 133.] **796 135**

Polyalkylene ether-polyurethane polymer and elastomeric products obtainable therefrom. Du Pont de Nemours & Co., E. I. [Divided out of 796 041.] [Addition to 731 071.] **796 044**

ACCEPTANCES

Open to public inspection 11 June

Rendering water-soluble cellulose ether more readily soluble in water. Dominion Tar & Chemical Co., Ltd. **796 405**

Lubricant additives and fuel additives for internal-combusion engines. Lubrizol Great Britain, Ltd. **796 408**

Fluorinated polymers. Farbwerke Hoechst AG. **796 326**

Insect deterrents. Trexler. H. L. **796 421**

Manufacture of artificial filaments and like products. British Celanese, Ltd. [Cognate application 16933.] **796 544**

Production of tetracycline by fermentation. Olin Mathieson Chemical Corp. **796 493**

Recovering synthetic phenol and other components of cumene hydroperoxide cleavage mixture by distillation. Rütgerswerke AG. **796 327**

Stabilisation of polyethylenes against oxidative degradation. Monsanto Chemical Co. **796 285**

Quaternary ammonium derivatives of unsaturated esters and amides and polyesters. Ciba Ltd. **796 543**

Alkali metal and amine salts of polymerisation products containing carboxyl groups and process for their manufacture. Ciba Ltd. **796 318**

Dental compositions. Merck & Co., Inc. **796 498**

Polymer hydrosols and coating compositions containing them, particularly for photography. Kodak Ltd. **796 401**

Dyeing nitrogenous fibrous materials. Ciba Ltd. **796 330**

Preparation of terephthalic acid. Bergwerksverband zur Verwertung von Schutzrechten der Kohlentechnik Ges. **796 286**

Air or gas filtering plant. Permentier, P. R. de. **796 414**

Surface treatment of polyethylene terephthalate films. Imperial Chemical Industries, Ltd. **796 341**

Purifying sulphuric acid by fractional crystallisation. Kellogg Co., M. W. **796 343**

Nozzles for the discharge of elastic fluid. Bristol Aero-Engines, Ltd. **796 291**

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